RTELLIGENT RSE Series

EtherCAT Communication Servo System

Users' Guide

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Foreword

First of all, thank you for purchasing the RSE series EtherCAT servo series products.
The RSE series servo is an EtherCAT communication type AC servo product independently developed by Rtelligent. The RSE series driver is based on the CoE standard framework and conforms to the CiA402 standard.
The driver supports CSP, CSV, CST, HM, PP, PV and PT control modes, and has 8 input signals and 4 output signals inside.

RSM series servo motors are equipped with a 17bit magnetic encoder as standard (23bit optical encoder and multiturn absolute encoders are optional), which have the characteristics of high precision and strong anti-interference. Among them, the frame below 80mm adopts a full series of ultra-thin high-density servo motors. It can achieve ultra-small installation size and high-speed precise positioning.

The cables for the RSE series servo system have certain requirements. It is recommended to use the motor and encoder cables that are supplied by Rtelligent. If the cables are equipped by yourself, they need to meet the corresponding sequence definition and specification requirements. Please confirm before use.

This manual is a comprehensive user manual for the RSE series products. Please read this manual carefully to confirm the relevant information before the formal power-on connection. If you have any doubts about product functions and performance, please consult our company's technical support. Due to the continuous improvement of product performance, the information provided by the company is subject to change without notice.

Packing List

RSE servo driver (including one DB44 terminal kit + one main circuit terminal) *1
RSM servo motor *1
Power extension cable*1
Encoder extension cable*1
Driver debugging software communication cable*1 (optional)
Brake extension cable for brake motor*1 (special for motor with brake)

Contents

1. Basic Specifications and Parameters of System

1.1 Specification of RSE driver

1.1.1 Driver naming method

RS **1500** **E** - □

① ② ③ ④

①**RS** Rtelligent servo driver

②**1500** Driver matching motor power (200/400/750/1500)

③FieldBus communication suffix:

E means EtherCAT communication

C means CANopen communication

None means pulse +485 communication

④Other custom function codes

1.1.2 Basic parameters of driver

Model	RS100E	RS400E	RS750E	RS1000E	RS1500E	RS3000E
Motor power	100W	400W	750W	1000W	1500W	3000W
Continuous current	3.0A	3.0A	5.0A	7.0A	9.0A	12.0A
Max current	9.0W	9.0A	15.0A	21.0A	27.0A	36.0A
Input power	Single phase 220VAC		Single phase 220VAC		Single / Three phase 220VAC	
Size code	Type A		Type B		Type C	
Model	178*160*41		178*160*51		203*178*70	

1.1.3 Driver electrical parameters

Project	Content
Control method	EtherCAT communication
Encoder type	Matching 17~23bit optical or magnetic encoder, support absolute encoder control
General input	8 channels/24V support common anode or common cathode
General output	4 single-ended + 2 differential outputs, single-ended (50mA) can be supported / differential (200mA) can be supported

1.1.4 Driver size

1.2 Specifications of RSM AC servo motor

1.2.1 AC servo motor naming method

RSM	A	M	60	J	06	30	A	-	Z
①	②	③	④	⑤	⑥	⑦	⑧		⑨

①Rtelligent RSM series AC servo motor

②Pole pair number code (A is 5 pairs of poles, No is 4 pairs of poles)

③Motor inertia code (S small inertia / M medium inertia / H large inertia)

④Motor base (40/60/80/110, etc.)

⑤Encoder code (J: 17bit magnetic encoder / H: 23bit optical encoder)

⑥Motor rated torque (06:0.6NM / 13:1.3NM, etc.)

⑦Motor rated speed (30:3000rpm / 20:2000rpm)

⑧Oil seal code (A: with oil seal / none: without oil seal)

⑨Brake code (Z: with brake / none: without brake)

1.2.2 AC servo motor basic parameters

Size	Model	Power	Motor length	Length with brake
40	RSM-M04J0130A	50W	72	112
	RSM-M04J0330A	100W	80	120
60	RSMA-M06J0630A	200W	80	126

	RSMA-M06J1230A	400W	98	144
80	RSMA-M08J2430A	750W	113	153
	RSMA-M08J3230A	1000W	128	168
110	RSM-M11J4030A	1.2KW	189	245
	RSM-M11J5030A	1.5KW	204	260
	RSM-M11J6030A	1.8KW	219	275
130	RSM-M13J5025A	1.3KW	171	241
	RSM-M13J6025A	1.5KW	179	249
	RSM-M13J7725A	2.0KW	192	262
	RSM-M13J10015A	1.5KW	213	283
	RSM-M13J10025A	2.5KW	209	279
	RSM-M13J15015A	2.3KW	241	311
	RSM-M13J15025A	3.8KW	231	301

1.2.3 Servo motor electrical parameters

<table>
<tr><th></th><th>Content</th></tr>
<tr><td>Rated voltage</td><td>220V</td></tr>
<tr><td>Encoder type</td><td>
<table>
<tr><th>encoder code</th><th>description</th></tr>
<tr><td>J</td><td>17bit single-turn magnetic absolute encoder</td></tr>
<tr><td>H</td><td>23bit single-turn optical absolute encoder</td></tr>
<tr><td>G</td><td>17bit multiturn magnetic absolute encoder</td></tr>
<tr><td>L</td><td>23bit multiturn optical absolute encoder</td></tr>
<tr><td>W</td><td>10000 lines optical encoder</td></tr>
</table>
</td></tr>
<tr><td>Number of pole pairs</td><td>4 pairs of poles/5 pairs of poles</td></tr>
<tr><td>Motor insulation class</td><td>Class F</td></tr>
<tr><td>Motor protection class</td><td>IP 65</td></tr>
<tr><td>Brake control voltage</td><td>24 VDC</td></tr>
</table>

Servo motor encoder selection instructions

The encoder is the position counting device of the servo motor, and the feedback of the motor

position and speed information provides the most important basis for the control of the driver.
It is obvious that a high-resolution encoder can "cut" the movement of the motor in one revolution into smaller units, so a high-resolution encoder can provide higher precision information.
Absolute encoders can feed back the absolute number of turns of the encoder, and an external battery can be used to keep the motor position information even after the driver is powered off. It is generally used in some high-precision and precise positioning occasions.
Restricted by the encoder manufacturing process and servo driver acquisition capabilities, our company provides up to 23-bit photoelectric encoders with the highest resolution of 8388608.
The default of our motor is 17bit magnetic encoder. Please choose the encoder specification of the servo motor reasonably according to your actual situation.

1.3 Specifications of supporting cables

Specifications of supporting cables

S	E	S	4	-	030
①	②	③	④		⑤

①Cable series code (S: 220V AC servo / D: low voltage brushless servo / H: 380V high voltage servo)

②Cable type code (E: encoder cable / M: motor power cable)

③Plug type (S: plastic amp head / H: aviation plug)

④Number of core of cable (power cables are 4 cores, which can be omitted; encoders have 4 cores or 6 cores, and 6 cores have batteries)

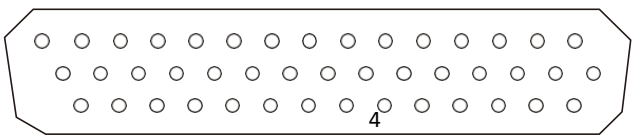
⑤Cable length (030: 3 meters)

2. Driver Wiring

2.1 Schematic diagram of each part of the driver

2.2 Driver wiring diagram

2.3 Driver control signal interface definition



Signal	Pin No.	Signal definition	Default function	Description
INCOM	1	Input common	-	● 24V signal input ● Support common anode or common cathode connection ● Does not support the simultaneous use of NPN and PNP
IN1	2	Input 1	Meaningless	
IN2	3	Input 2	Probe 1	
IN3	4	Input 3	Probe 2	
IN4	5	Input 4	Positive limit	
IN5	6	Input 5	Negative limit	
IN6	7	Input 6	Homing signal	
IN7_24V+	16	Input 7	Meaningless	Differential input terminal: ● 24V signal is connected to IN7_24V and IN7- terminals ● 5V signal is connected to IN7_5V+ and IN7- terminals
IN7_5V+	17			
IN7-	18			
IN8_24V+	19	Input 8	Emergency stop	Differential input terminal: ● 24V signal is connected to IN8_24V and IN8- terminals ● 5V signal is connected to IN8_5V+ and IN8- terminals
IN8_5V+	20			
IN8-	21			

2.3.1 General output interface

Signal	Pin No.	Signal definition	Default function	Description
OUTCOM-	31	Output common	-	● Common cathode output ● The current does not exceed 50mA
OUT1	32	Output 1	Servo ready	
OUT2	33	Output 2	Alarm output	
OUT3+	34	Output 3	Position arrival	● Differential output ● The current does not exceed 200mA
OUT3-	35			
OUT4+	36	Output 4	Brake output	
OUT4-	37			

3. Driver Panel Display and Operation

The display panel of the servo drive is composed of 5 buttons and a 5-digit LED digital tube display, which is used to realize various status information display, trial operation, parameter management and other functions. The 5 keys are identified as:

Functions	Symbol	Description	Diagram
Mode/Return	MODE	Mode switch	
Shift key		Shift left	
Increase		Switch up selection or increase value	
Decrease		Switch down selection or decrease the value	
Confirm	SET	Confirm operation	

Panel display content

When the servo driver is running, the LED display can be used for servo monitoring display, parameter display, function display, parameter management, encoder adjustment, and open loop operation.

Monitoring display: display the current running status of the servo;

Parameter display: display the set value of servo control parameters;

Function display: internal test run operation;

Parameter management: used to manage servo control parameters;

Encoder adjustment, open loop operation: the manufacturer reserves the function.

4. Description of EtherCAT Communication

4.1 Overview of EtherCAT protocol

EtherCAT is an industrial Ethernet technology with high performance, low cost, simple application and flexible topology. It can be used in industrial field-level ultra-high-speed I/O network, using standard Ethernet physical layer, transmission media twisted pair or optical fiber (100Base-TX or 100Base-FX).

The EtherCAT system consists of a master station and a slave station. The master station only needs an ordinary network card, and the slave station needs a dedicated slave station control chip, such as: ET1100, ET1200, FPGA, etc.

EtherCAT one network to the end, protocol processing directly to the I/O layer:

①No need for any lower sub-bus

②No gateway delay

③A single system can cover all equipment: input and output, sensors, actuators, drivers, displays…

④Transmission rate: 2 x 100Mbit/s (high-speed Ethernet, full duplex mode)

⑤Synchronization: The distance between the two devices is 300 nodes, the cable length is 120 meters, and the synchronization jitter is less than 1us

⑥Refresh time:

256 digital I/O: 11us

1000 switch I/O distributed in 100 nodes: 30us

200 analog I/O (16bit): 50us

100 servo axes (each 8 Byte IN+OUT): 100us

12000 digital I/O: 350us

In order to support more types of devices and a wider range of application layers, EtherCAT has established the following application protocols:

CoE (CAN application protocol based on EtherCAT)

SoE (servo driver profile conforming to IEC61800-7-204 standard)

EoE (EtherCAT realizes Ethernet)

FoE (EtherCAT realizes file reading)

The slave device does not need to support all communication protocols. On the contrary, it only needs to select the communication protocol most suitable for its application.

4.2 System parameter setting

Object Dictionary	Object dictionary sub-index	Name	Setting range	Default value
0x2003	01h	Control mode selection	0：position mode 1：Speed mode 2：Torque mode 3：EtherCAT mode	3

4.3 EtherCAT communication basics

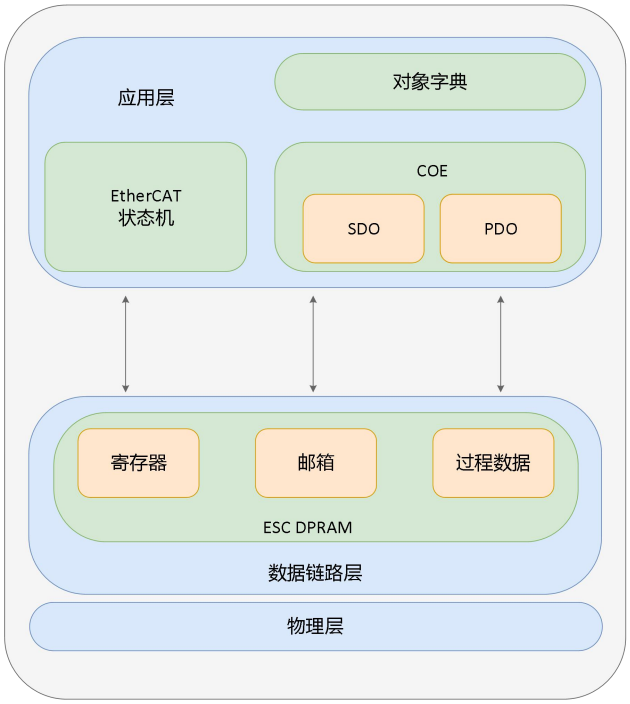
4.3.1 EtherCAT communication specification

Item		Specification
letter of agreement		IEC 61158 Type 12，IEC 61800-7 CIA402 Driver Profile
Application layer	SDO	SDO request、SDO response
	PDO	Variable PDO mapping
	CIA402	Profile position mode（PP） Profile velocity mode（PV） Profile torque mode（PT） Home position mode（HM） Cyclic synchronous position mode（CSP） Cyclic synchronous velocity mode（CSV） Cyclic synchronous torque mode（CST）
Physical layer	Transfer protocol	100BASE-TX（IEEE802.3）
	Maximum distance	100M
	Interface	RT45 * 2（IN、OUT）

4.3.2 Communication structure

There are a variety of application layer protocols using EtherCAT communication. In the RS EtherCAT series servo drivers, the IEC61800-7 (CIA402)-CANOpen motion control sub-protocol is used.

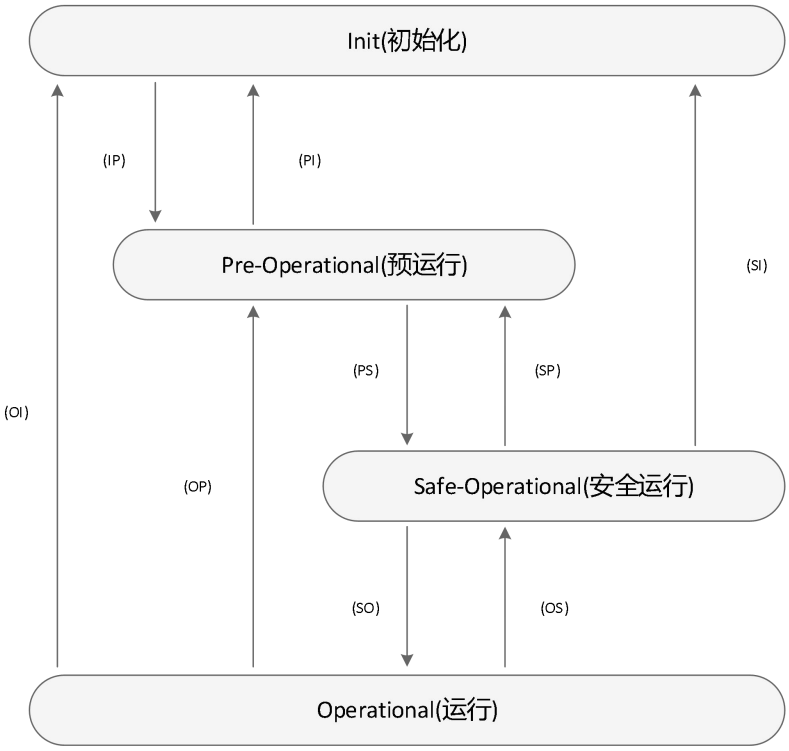
The figure below is the EtherCAT communication structure based on the CANOpen application layer.



In the structure diagram, the application layer object dictionary contains: communication parameters, application program data, and PDO mapping data. The PDO process data object contains real-time data during the operation of the servo drive, and is accessed periodically for reading and writing. To communicate with the DSO mailbox, access and modify some communication parameter objects and PDO process data objects non-periodically.

State machine

The following is the block diagram of EtherCAT state transition:



The EtherCAT device must support 4 states and is responsible for coordinating the state relationship between the master station and the slave station application program during initialization and operation.

Init：Initialization, abbreviated as I

Pre-Operational：Pre-Operational, abbreviated as P

Safe-Operational：Safe operationalal, abbreviated as S

Operational：Operation, abbreviated as O

When transitioning from the initialization state to the running state, the conversion must be done in the order of "initialization→pre-operation→Safe operationalal→operation", and no leapfrogging is allowed. You can skip the conversion when returning from the running state. The state conversion operation and initialization process are as follows:

State and state transition	Operation
Initialization（I）	There is no communication at the application layer, and the master station can only read and write ESC registers
IP	Master station configures slave station address Configure mailbox channel Configure the DC branch clock Request "Pre-Operational" status
Pre-Operational（P）	Application layer mailbox data communication（SDO）
PS	The master station uses the mailbox to initialize the process data mapping The master station configures the SM channel used for process data communication Master station configures FMMU Request "Safe operationalal"
Safe operationalal（S）	There is process data communication, but only the input data is allowed to be read, and no output signal is generated（SDO、TPDO）
SO	The master station sends valid output data Request "Operational"
Operational（O）	Input and output are all valid（TPDO、RPDO） Mail can still be used for communication（SDO）

Process data PDO

The transmission of PDO real-time process data follows the producer-consumer model. PDO can be divided into RPDO (Reception PDO), the slave station receives the command of the master station through RPDO; and TPDO (Transmission PDO), the slave station feedbacks its own state through TPDO.

PDO mapping parameters

PDO mapping is used to establish the mapping relationship with PDO in the object dictionary. 1600h ~ 17FFh are RPDO, 1A00h ~ 1BFFh are TPDO, RS EtherCAT series servo drivers have 3 RPDOs and 3 TPDOs for selection, as shown in the following table:

PDO	Index	Maximum number of mappings	Longest byte	Default mapping object
RPDO	1600h	12	48	6040（control word） 607A（target position） 60B8（probe function）
RPDO1	1601h	12	48	6040（control word） 607A（target position） 6081（profile speed） 6083（profile acceleration） 6084（profile deceleration） 6060（mode selection）
RPDO2	1602h	12	48	6040（control word） 6083（profile acceleration） 6084（profile deceleration） 60FF（target speed） 6060（mode selection）
TPDO0	1A00h	12	48	603F（error code） 6041（status word） 6061（mode display） 6064（position feedback） 60B9（probe status） 60BA（position feedback on rising edge of probe 1） 60FD（DI status）
TPDO1	1A01h	12	48	6041（status word） 6061（mode display）

				606C（speed feedback） 60FD（DI status）
TPDO2	1A02h	12	48	6041（status word） 6064（position feedback）

Synchronization manager PDO distribution settings

In EtherCAT periodic data communication, the process data can contain multiple PDO mapping data objects. The data objects 0x1C10 ~ 0x1C2F used by the CoE protocol define the corresponding SM (synchronous management channel) PDO mapping object list. Multiple PDOs can be mapped in different Sub-index.

In RS EtherCAT series servo drivers, 1 RPDO frequency division and 1 TPDO frequency division are supported, as shown in the following table:

Index	Sub-index	Content
0x1C12	01h	Choose to use one of 0x1600, 0x1601, 0x1602 as the actual RPDO used
0x1C13	01h	Choose to use one of 0x1A00, 0x1A01, 0x1A02 as the actual TPDO used

PDO configuration

The PDO mapping parameter includes a pointer to the process data corresponding to the PDO that the PDO needs to send or receive, including the index, sub-index, and the length of the mapping object. Among them, the sub-index 0 records the number N of objects specifically mapped by the PDO, and the data length of each PDO can be up to 4*N bytes, and one or more objects can be mapped at the same time. Sub-index 1 ~ N are the mapping content. The contents of the mapping parameters are defined as follows:

Number of digits	31	……	16	15	……	8	7	……	0
Meaning	Index			Sub-index			Object length		

The index and sub-index jointly determine the position of the object in the object dictionary. The length of the object indicates the specific bit length of the object, expressed in hexadecimal:

Object length	Bit length
08h	8bit
10h	16bit
20h	32bit

For example, the mapping parameter representing the 16bit control word 6040h-00 is 60400010h.

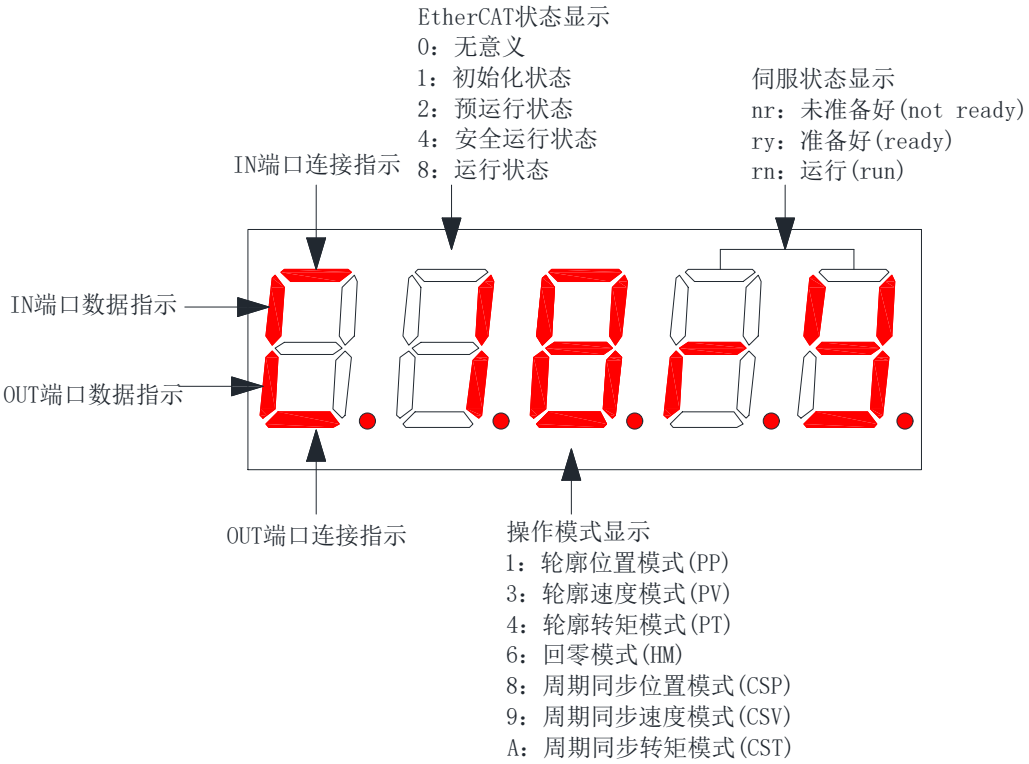
Mailbox data SDO

EtherCAT mailbox data SDO is used to transmit non-periodic data, such as the configuration of communication parameters, the configuration of servo drive operating parameters, etc. EtherCAT's CoE service types include: 1. Emergency information; 2. SDO request; 3. SDO response; 4. TXPDO; 5. RXPDO; 6. Remote TXPDO sending request; 7. Remote RXPDO sending request; 8. SDO information. EDistributed clock

The distributed clock can make all EtherCAT devices use the same system time, thereby controlling the synchronous execution of the tasks of each device. The slave device can generate synchronization signals based on synchronized system events. RS EtherCAT series drives support SM synchronization mode and DC synchronization mode. The synchronization cycle is controlled by SYNC0, and the cycle range varies according to different motion modes.

Status indication

The object can be monitored by the driver LED:



Communication connection status

The RS EtherCAT servo driver uses the upper and lower "-" of the first digital tube from the left in the 5-digit LED indicator on the panel to reflect the connection status of the two RJ45 ports: upper "-" (IN port), lower "-" (OUT port)

Long dark: The physical layer does not detect the communication connection

Steady on: The physical layer has established a communication connection

Data transfer status

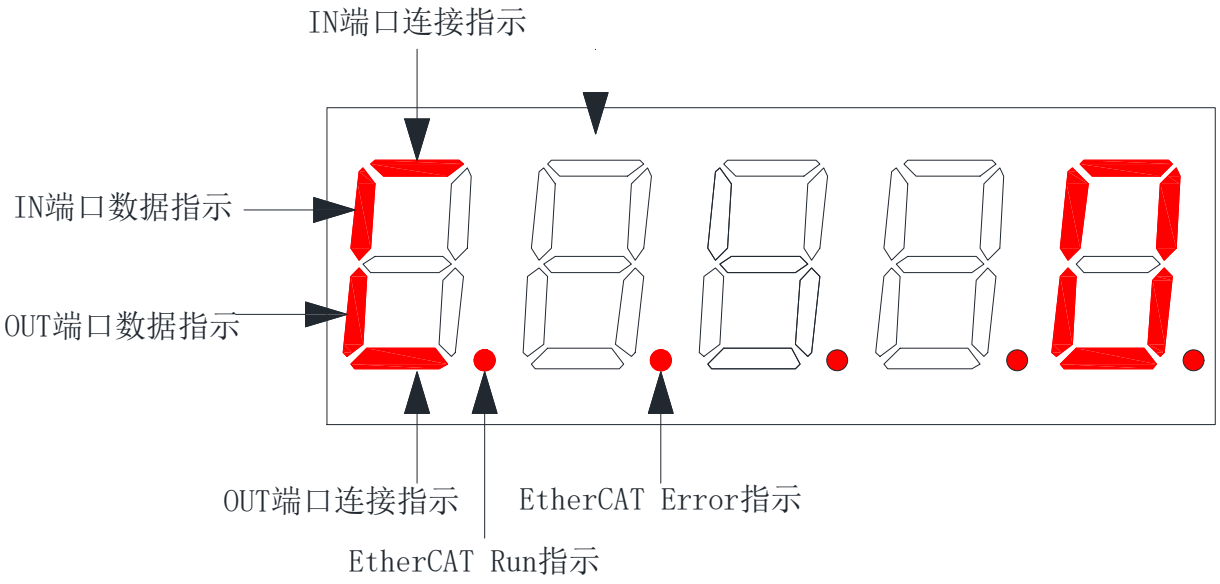
The RS EtherCAT servo driver uses the upper and lower "｜" of the first digital tube from the left in the 5-digit LED indicator on the panel to reflect the data transmission status of the two RJ45 ports: the upper "｜" (IN port), the lower "｜" (OUT port)

Flashing: data is being transferred

Communication operation status

The communication and servo status and the communication connection status are displayed on the same interface. The second digit from the left of the 5-digit LED indicator on the panel displays the status of the slave station's EtherCAT state machine in character form.

Or under the LED speed monitoring interface: The decimal point of the first digit from the left in the 5-digit LED indicator on the panel indicates the running status of EtherCAT, which is defined as follows:



LED	Status	Description
EtherCAT Run indication	Not bright	Initialization
	Slow Flash	Pre-Operational
	Single flash	Safe-Operational
	Constant light	Operational

EtherCAT Error indication	Not bright	No errors
	Slow Flash	General error
	Single flash	Synchronization error
	Double flash	Watchdog error

Remarks:

Fast flash: bright for 50ms, dark for 50ms (10Hz).

Slow flash: bright for 200ms, dark for 200ms (2.5Hz).

Single flash: 200ms bright, 1000ms dark.

Double flash: bright for 200ms, dark for 200ms, bright for 200ms, dark for 1000ms.

Servo mode display

The communication and servo status and the communication connection status are displayed on the same interface. The third digital tube from the left in the 5-digit LED indicator on the panel displays the current servo operating mode in the form of hexadecimal numbers.

Servo operating modes include the following:

Servo operation mode display 6060h	Panel display
1：Profile position mode	1
3：Profile velocity mode	3
4：Profile torque mode	4
6：Homing mode	6
8：Cyclic synchronous position mode	8
9：Cyclic synchronous velocity mode	9
10：Cyclic synchronous velocity mode	A

Servo status display

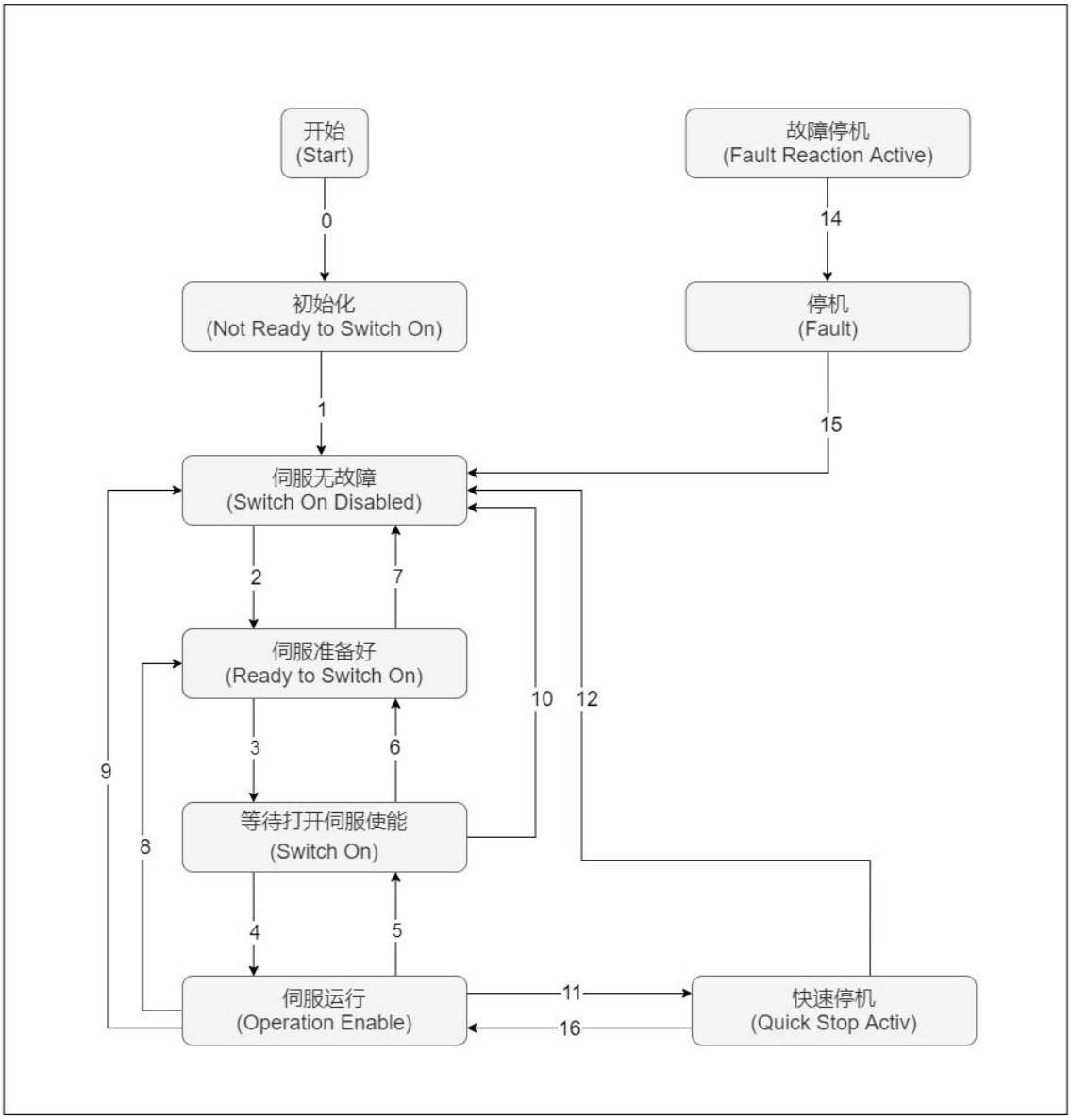
The communication and servo status and the communication connection status are displayed on the same interface. The 4th to 5th digits from the left of the 5-digit LED indicator on the panel display the servo status of the slave station in the form of characters.

The servo status includes the following:

Status	Description	Panel display
Reset	Servo driver is powering on and initializing	-
Not ready	The initialization has been completed, the power is not connected or the servo is faulty Not Ready	nr
Ready	The power supply has been connected, and the servo enable is invalid Ready	ry
Run	Servo enable is valid, and the motor is running when power is on Run	rn

CIA402 control introduction

To use RS EtherCAT driver, the servo driver must be guided in accordance with the process specified in the standard CiA402 protocol, so that the servo driver can run in the specified state.



The description of each state is as follows:

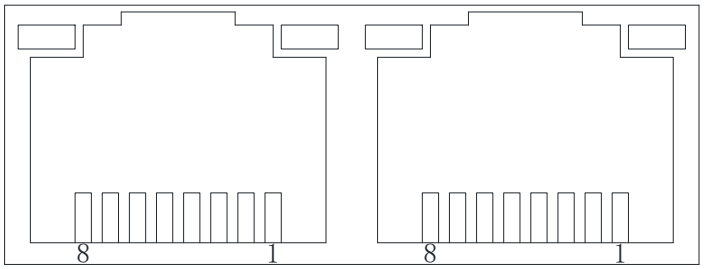
Not ready to switch on	Driver initialization and internal self-check have been completed The parameters of the driver cannot be set, nor can it execute the drive function
Switch on disabled	The servo driver has no fault or the error has been eliminated Driver parameters can be set
Ready to switch on	Servo drive is ready Driver parameters can be set
Switch on	Servo driver is waiting to turn on the servo enable Driver parameters can be set
Operation enable	The driver is operating normally, a certain servo operation mode has been enabled, the motor has been energized, and when the command is not 0, the motor will rotate The driver parameter attribute can be set as "operational change",

	otherwise it cannot be set.
Quick stop active	The quick stop function is activated and the driver is executing the quick stop function The driver parameter attribute can be set as "operational change", otherwise it cannot be set.
Fault reaction active	The driver has failed and is in the process of shutdown The driver parameter attribute can be set as "operational change", otherwise it cannot be set.
Fault	When the fault stop is completed, all driver functions are prohibited, and the driver parameters are allowed to be changed to eliminate the fault.。

Basic characteristics

Interface information

The EtherCAT network cable is connected to the RJ45 terminal with a metal shield, and has input (IN/CN5) and output (OUT/CN4) interfaces. The electrical characteristics comply with IEEE802.3 and ISO8877 standards.

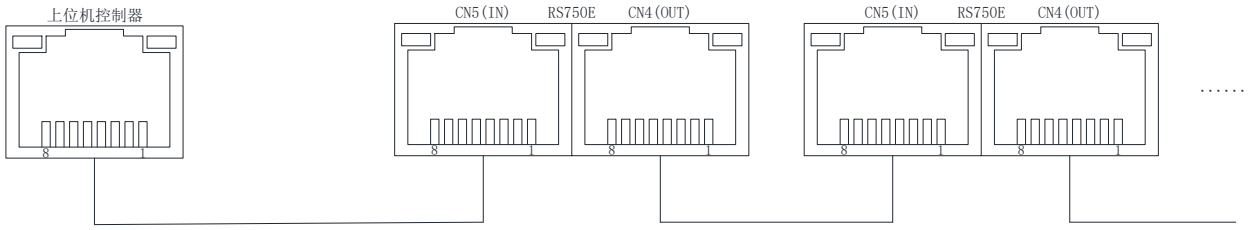


Pin	Definition	Description
1	TX+	Data transmission +
2	TX-	Data transmission -
3	RX+	Data reception +
4	NULL	/
5	NULL	/
6	RX-	Data reception -
7	NULL	/
8	NULL	/

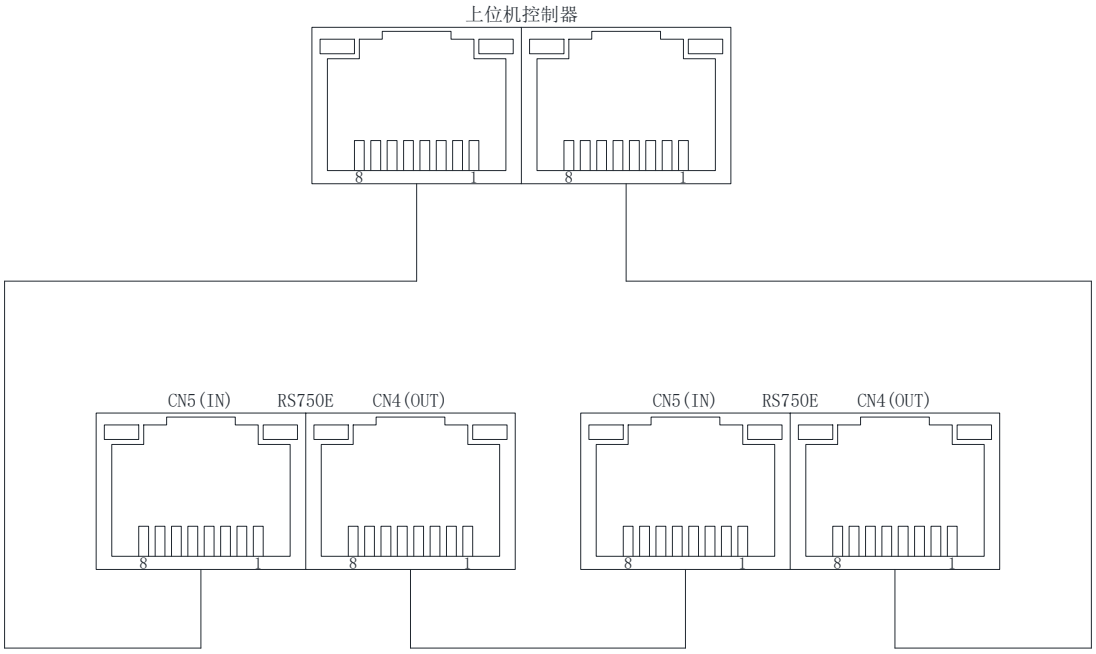
Topological connection

The EtherCAT communication topology connection is flexible and basically has no restrictions. This servo has IN (CN5) and OUT (CN4) interfaces. The topology connections are as follows.

Linear connection:



Redundant ring connection:



Communication Cable

EtherCAT communication cable uses Ethernet Category5 (100BASE-TX) network cable or high-strength shielded network cable. When using the servo driver, it is also necessary to use a shielded network cable with a length not exceeding 100M. Shielding the network cable will enhance the anti-interference ability of the system.

5. Control Mode

5.1 Basic settings

5.1.1 Conversion factor setting

Object 6091h is used to set the electronic gear ratio of the servo driver:
The essential meaning of gear ratio is: when the load shaft is displaced by one command unit, the corresponding motor displacement (unit: encoder unit). The gear ratio is composed of the numerator 6091-01h and the denominator 6091-02. Through the gear ratio, the proportional relationship between the displacement of the load shaft (command unit) and the displacement of the motor (encoder unit) can be established:
Motor displacement = load shaft displacement x gear ratio
The motor and the load are connected with other mechanical transmission mechanisms through a reducer. Therefore, the gear ratio is related to the mechanical reduction ratio, mechanical size-related parameters, and motor resolution. The calculation method is as follows:

$$\text{Gear ratio} = \frac{\text{Motor resolution}}{\text{Load shaft resolution}}$$

<table>
<tr><td rowspan="2">Index
6091h</td><td>Name</td><td colspan="5">Gear ratio</td><td>Data structure</td><td>ARR</td><td>Data type</td><td>Uint32</td></tr>
<tr><td>Data range</td><td>OD data range</td><td>Factory setting</td><td>OD default value</td><td>Accessibility</td><td>-</td><td>Related modes</td><td>PP/PV/CSP/CSV/HM</td><td>Mapped</td><td>YES</td></tr>
<tr><td colspan="11">The gear ratio is used to establish the proportional relationship between the displacement of the load shaft specified by the user and the displacement of the motor shaft.
1）、The relationship between motor feedback position (encoder unit) and load shaft position feedback (command unit):
$$\text{Motor feedback position} = \text{load shaft position feedback} \times \text{gear ratio}$$
2）、The relationship between motor speed (rpm) and load shaft speed (command unit/s):
$$\text{Motor speed(rpm)} = \frac{\text{load shaft speed} \times \text{gear ratio}}{\text{encoder resolution}} \times 60$$
3）、The relationship between motor acceleration (rpm/ms) and load speed (command unit/s2):
$$\text{Motor acceleration} = \frac{\text{load shaft acceleration} \times \text{gear ratio}}{\text{encoder resolution}} \times \frac{1000}{60}$$</td></tr>
</table>

Sub-index 00h	Name	Maximum sub-index number of gear ratio				Data structure	-	Data type	Uint8
	Data range	-	Factory setting	2	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Gear ratio numerator				Data structure	VAR	Data type	Int32
	Data range	1 ~ (231-1)	Factory setting	1	Accessibility	RW	Related modes	-	Mapped	RPDO

Sub-index 02h	Name	Gear ratio denominator				Data structure	VAR	Data type	Int32
	Data range	1 ~ (231-1)	Factory setting	1	Accessibility	RW	Related modes	-	Mapped	RPDO

Take the ball screw as an example:

Minimum command unit fc = 1mm

Screw lead PB = 10mm/r

Reduction ratio n = 5:1

The encoder resolution of the motor model RSMA-M08J2430A is P = 131072(p/r)

Therefore, the location factor is calculated as follows:

$$\text{Location factor} = \frac{P \times n}{PB} = \frac{131072 \times 5}{10} = \frac{65536}{1}$$

Therefore:

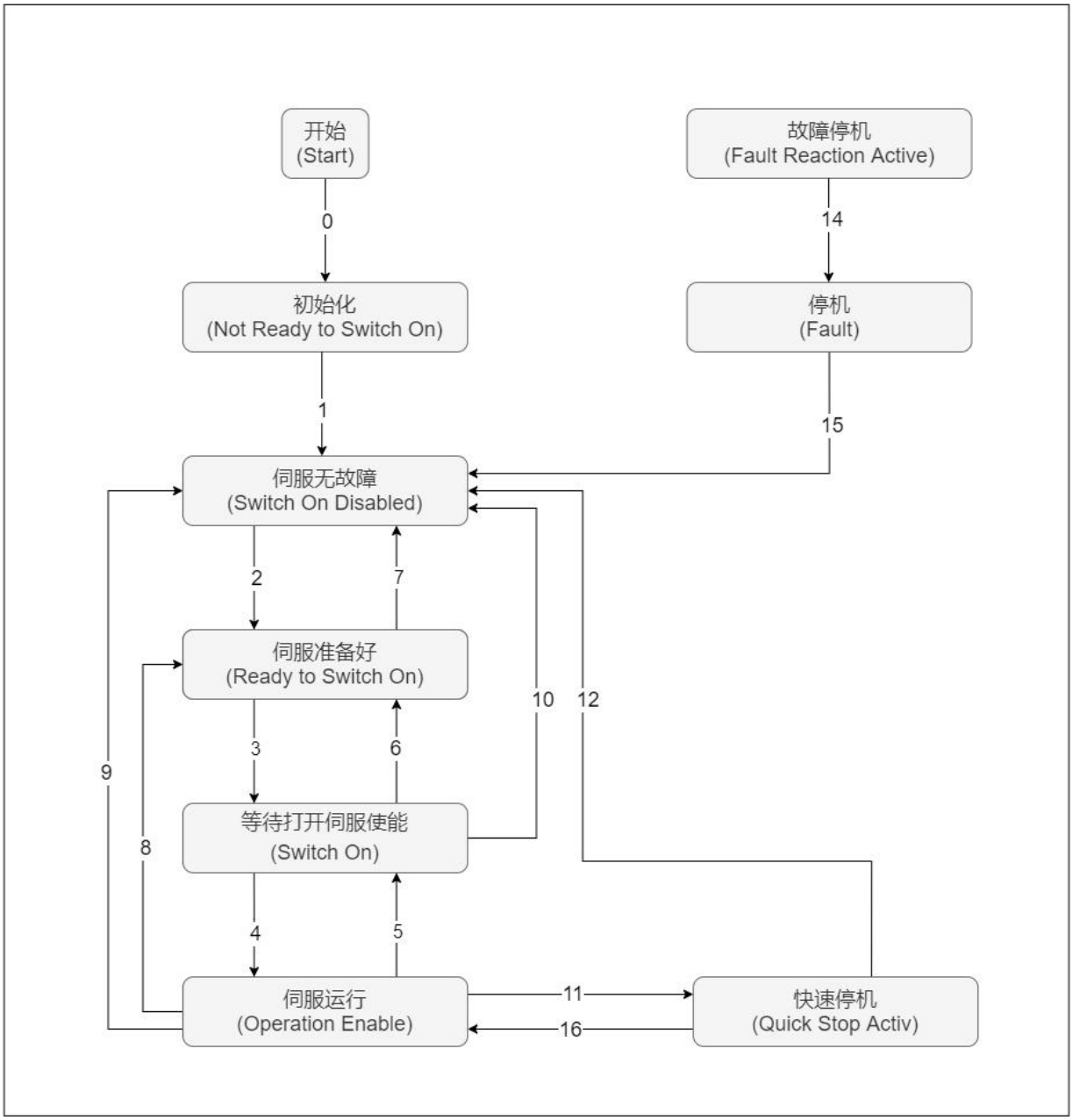
6091-01h = 65536

6091-02h = 1

Its essential meaning is: when the load displacement is 1mm, the motor displacement is 65536 strokes (encoder unit)

5.1.2 Servo status setting

The servo driver must be guided in accordance with the procedure stipulated in the standard CiA402 protocol before the servo driver can run in the specified state.



Not ready to switch on	Driver initialization and internal self-check have been completed The parameters of the driver cannot be set, nor can it execute the drive function
Switch on disabled	The servo driver has no fault or the error has been eliminated Driver parameters can be set
Ready to switch on	Servo drive is ready Driver parameters can be set
Switch on	Servo driver is waiting to turn on the servo enable Driver parameters can be set
Operation enable	The driver is operating normally, a certain servo operation mode has

	been enabled, the motor has been energized, and when the command is not 0, the motor will rotate The driver parameter attribute can be set as "operational change", otherwise it cannot be set.
Quick stop active	The quick stop function is activated and the driver is executing the quick stop function The driver parameter attribute can be set as "operational change", otherwise it cannot be set.
Fault reaction active	The driver has failed and is in the process of shutdown The driver parameter attribute can be set as "operational change", otherwise it cannot be set.
Fault	When the fault stop is completed, all driver functions are prohibited, and the driver parameters are allowed to be changed to eliminate the fault.。

Control commands and status switching:

CiA402 status switch		Control word 6040h	Bit0 ~ Bit9 of status word 6041h
0	Power on → Initialize	Natural transition without control commands	0x0000
1	Initialization → Servo without fault	Natural transition without control commands	0x0250
2	Servo without fault → Servo is ready	0x0006	0x0231
3	Servo ready → Waiting to turn on the servo enable	0x0007	0x0233
4	Waiting to turn on the servo enable → Servo running	0x000F	0x0237
5	Servo running → Waiting to turn on the servo enable	0x007	0x0233
6	Waiting to turn on the servo enable → Servo is	0x006	0x0231

	ready		
7	Servo is ready → Servo without fault	0x0000	0x0250
8	Servo running → Servo is ready	0x0006	0x0231
9	Servo running → Servo without fault	0x0000	0x0250
10	Waiting to turn on the servo enable → Servo without fault	0x0000	0x0250
11	Servo running → Quick stop	0x0002	0x217
12	Quick stop → Servo without fault	Natural transition after the shutdown is completed, no control commands are required	0x0250
13	→Fault shutdown	In any state other than "fault", once the servo driver fails, it will automatically switch to the fault stop state without command control	0x021F
14	Fault shutdown → Fault	After the fault is completed, it will transition naturally without control commands	0x0218
15	Fault → Servo without fault	0x80	0x0250
16	Quick stop → Servo running	After the shutdown is complete, send 0x0F	0x0237

5.1.3 Control word 6040h

Index 6040h	Name	Control word					Data structure	VAR	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0	Accessibility	RW	Related modes	ALL	Mapped	RPDO

Set control commands:

Bit	Name	Description
0	Switch on	0：invalid，1：valid
1	Enable voltage	0：invalid，1：valid
2	Quick stop	0：invalid，1：valid
3	Enable operation	0：invalid，1：valid
4 ~ 6	Operation mode related	Related to servo operation mode
7	Fault reset	For resettable faults and warnings, executive the fault reset function The positive edge of Bit7 is valid; Bit7 remains at 1, and other control commands are invalid
8	Halt	605Dh：For the pause mode in each mode, please query the object dictionary 605Dh
9	Operation mode related	Related to each servo operation mode
10	Reversed	Undefined
11 ~ 15	Manufacturer-specific	Manufacturer-specific

Note:

1). It is meaningless to assign each Bit of the control word individually, and it must form a control command with others that do not work together;

2)Bit0 ~ Bit3 and Bit7 have the same meaning in each servo mode. Commands must be sent in order to guide the servo driver into the expected state according to the CiA402 state machine switching process. Each command corresponds to a certain state;

3)Bit4 ~ Bit6 are related to each servo mode, please check the control commands in different modes;

4). Bit9 has no defined function.

5.1.4 Status word 6041h

Index 6041h	Name	Status word					Data structure	VAR	Data type	Uint16
	Data range	0～65535	Factory setting	0	Accessibility	RO	Related modes	ALL	Mapped	TPDO

Reflect the current running status of the servo driver:

Bit	Name	Description
0	Ready to switch on	0：invalid，1：valid
1	Switch on	0：invalid，1：valid
2	Operation enabled	0：invalid，1：valid
3	Fault	0：invalid，1：valid
4	Voltage enabled	0：invalid，1：valid
5	Quick stop	0：invalid，1：valid
6	Switch on disabled	0：invalid，1：valid
7	Warming	0：invalid，1：valid
8	Manufacturer- specific	Undefined function
9	Remote	0：invalid，1：valid (control word takes effect)
10	Target reach	0：invalid，1：valid
11	Internal limit active	0：invalid，1：valid
12～13	Operation mode related	Related to servo operation mode
14	Manufacturer-specific	Undefined function
15	Home find	0：invalid，1：valid

Display value (binary value)	Description
xxxx xxxx x0xx 0000	Not ready to switch on
xxxx xxxx x1xx 0000	Switch on disabled
xxxx xxxx x01x 0001	Ready to switch on
xxxx xxxx x01x 0011	Switch on
xxxx xxxx x01x 0111	Operation enabled
xxxx xxxx x00x 0111	Quick stop active)
xxxx xxxx x0xx 1111	Fault reaction active
xxxx xxxx x0xx 1000	Fault

Note:
1)Bit0 ~ Bit9 have the same meaning in each servo mode. After the control word 6040h sends commands in order, the servo will feedback a certain state.
2)Bit12 ~ Bit13 are related to each servo mode (please check the control commands in different modes)
3) Bit10, Bit11, and Bit15 have the same meaning in each servo mode, and feedback the status of the servo after executing a certain servo mode.

5.1.5 Servo mode setting

5.1.5.1 Introduction to servo mode

Index 60FFh	Name	Support servo operation mode					Data structure	VAR	Data type	Uint32
	Data range	-	Factory setting	941	Accessibility	RO	Related modes	-	Mapped	NO

Reflect the servo operation mode supported by the driver:

Bit	Description	Supported or not (0: not supported, 1: supported)
0	PP	1
1	VL	0
2	PV	1
3	PT	1
4	NA	0
5	HM	1
6	IP	0
7	CSP	1
8	CSV	1
9	CST	1
10 ~ 31	NA	0

Index 6060h	Name	Mode selection					Data structure	VAR	Data type	Int16
	Data range	0 ~ 10	Factory setting	8	Accessibility	RW	Related modes	ALL	Mapped	RPDO

Select the servo operation mode:

Setting value	Servo mode

0/2/5	NA
1	PP
3	PV
4	PT
6	HM
7	IP
8	CSP
9	CSV
10	CST

Index 6061h	Name	Operation mode display					Data structure	VAR	Data type	Int16
	Data range	0 ~ 10	Factory setting	0	Accessibility	RO	Related modes	ALL	Mapped	TPDO

Display the current operation mode of the servo driver:

Setting value	Servo mode
0/2/5	NA
1	PP
3	PV
4	PT
6	HM
7	IP
8	CSP
9	CSV
10	CST

5.1.5.2 Mode switch

Modify the value of the 6060h dictionary online to realize the mode switching function.

Precautions for the use of servo operation status switching:

①When the servo driver is in any state, after switching from the PP mode or the CSP mode to other modes, the unexecuted position commands will be discarded.

②When switching from other modes to cyclic synchronization mode, please send the command at least 5ms apart, otherwise command loss or error will occur.

5.1.6 Cyclic synchronous position mode（CSP）

In the cyclic synchronous position mode, the host computer executes the position command planning, and then sends the planned target position 607Ah to the servo driver in a periodic synchronous manner. The position, speed, and torque control are completed internally by the servo driver.

Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0～Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
7	Reset Fault	0：No effect 1：Reset driveR fault

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target position is not reached 1：Target position reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
12	Driver Follow the Command	0：The slave does not follow the command 1：Slave follows the command
13	Following Error	0：There is no excessive position deviation fault 1：An excessive position deviation fault occurs
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
603F	00	error code	Uint16	-	RO	0
6040	00	Control word	Uint16	0～65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0～10	RW	8

6061	00	Mode display	Int16	-	RO	8
6062	00	Position command (unit: command unit)	Int32	-	RO	-
6063	00	Position feedback (unit: encoder unit)	Int32	-	RO	-
6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
6065	00	Threshold for excessive position deviation (unit: command unit)	Uint32	0 ~ 232-1	RW	393216
6067	00	Position reached threshold (unit: encoder unit)	Uint32	0 ~ 65535	RW	92
6068	00	Position reached time window (unit: ms)	Uint16	0 ~ 65535	RW	10
606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-
6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
607A	00	Target position (unit: command unit)	Int32	-231 ~ 231-1	RW	0
6091	01	Gear ratio numerator	Uint32	1 ~ 232-1	RW	1
	02	Gear ratio denominator	Uint32	1 ~ 232-1	RW	1
60F4	00	Position deviation (unit: command unit)	Int32	-	RO	-
60FC	00	Position command (unit: encoder unit)	Int32	-	RO	-
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	03	Position loop gain	Uint16	0 ~ 50000	RW	800
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Related function settings

Positioning completion signal

Index (Hex)	Sub-index (Hex)	Name	Description
2006	07	Position reached threshold unit selection	Set the unit of 6067h: 0: Command unit 1: Encoder unit
6067	00	Position reached threshold	When the absolute value of the position deviation is within 6067h and the time reaches 6068h, the DO signal after positioning is valid, and 6041h.Bit10 is set to 1. If either of the two conditions is not met, the position arrival is invalid
6068	00	Position reached time window	

Threshold for excessive position deviation

Index (Hex)	Sub-index (Hex)	Name	Description
6065	00	Threshold for excessive position deviation	When the absolute value of the position deviation is greater than the set value, an excessive position deviation fault occurs, the driver LED panel will display AL.240, and the status word 6041h4.Bit13 is set to 1 When the set value is 0xFFFFFFFF, the driver will not detect excessive position deviation

Recommended configuration

RPDO	TPDO	Description
6040h: Control Word	6041h: Status Word	Must
607Ah: Target Position	6064h: Position Actual Value	Must
6060h: Modes of Operation	6061h: Modes of Operation Display	Optional
	603Fh: Error Code	Optional
	60FDh: Digital Inputs	Optional

5.1.7 Cyclic synchronous velocity mode（CSV）

In the cyclic synchronous velocity mode, the upper controller sends the planned target velocity of 60FFh to the servo driver in a periodic synchronous manner, and the speed and torque control is completed by the servo driver.

Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0 ~ Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
7	Reset Fault	0：No effect 1：Reset driver fault

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target velocity is not reached 1：Target velocity reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
12	Driver Follow the Command	0：The slave does not follow the command 1：Slave follows the command
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
6040	00	Control word	Uint16	0 ~ 65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0 ~ 10	RW	8
6061	00	Mode display	Int16	-	RO	8
6063	00	Position feedback (unit: encoder unit)	Int32	-	RO	-
6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-

6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
6091	01	Gear ratio numerator	Uint32	1 ~ 231-1	RW	1
	02	Gear ratio denominator	Uint32	1 ~ 231-1	RW	1
60FF	00	Target velocity (unit: command unit/s)	Int32	-231 ~ 231-1	RW	0
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Related function settings

Speed reached output function

Index (Hex)	Sub-index (Hex)	Name	Description
606D	00	Speed reached threshold	When the absolute value of the difference between the target velocity 60FF (converted into the unit of motor speed rpm) and the actual motor speed is within 606Dh, and the time set by 606Eh is maintained, the status word 6041h.bit10 is set to 1, and the speed reaches DO function is valid
606E	00	Speed reached time window	

Recommended configuration

RPDO	TPDO	Description
6040h：Control Word	Status Word	Must
6060h：Modes of Operation	Modes of Operation Display	Optional
60FFh：Target Velocity		Must
	6064h：Position Actual Value	Optional
	606Ch：Velocity Actual Value	Optional
	603Fh：Error Code	Optional
	60FDh：Digital Inputs	Optional

5.1.8 Cyclic synchronous torque mode（CST）

In this mode, the host computer sends the calculated target torque 6071h to the servo drive periodically and synchronously, and the torque adjustment is executed internally by the servo driver. When the motor speed reaches the limit value, it will enter the speed regulation stage.

Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0～Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
7	Reset Fault	0：No effect 1：Reset driver fault

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target torque is not reached 1：Target torque reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
12	Driver Follow the Command	0：The slave does not follow the command 1：Slave follows the command
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
6040	00	Control word	Uint16	0～65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0～10	RW	8
6061	00	Mode display	Int16	-	RO	8
6063	00	Position feedback (unit: encoder unit)	Int32	-	RO	-

6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-
6071	00	Target torque (unit: 0.1%)	Int16	-3000 ~ 3000	RW	0
6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6074	00	Torque command (unit: 0.1%)	Int16	-5000 ~ 5000-	RO	-
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Related function settings

Torque reached output setting

Index (Hex)	Sub-index (Hex)	Name	Description
2008	0A	Reference value of torque reached	Reference value of torque ： A Valid value of torque reached： B Invalid value of torque reached： C When: |Torque actual value|> |A + B|, the torque reached DO is valid, and the status word 6041h.bit10 is set to 1 When: |Torque actual value| <|A + C|, the torque reached DO is invalid, and the status word 6041h.bit10 is cleared
2008	0B	Valid value of torque reached	
2008	0C	Invalid value of torque reached	

Recommended configuration

RPDO	TPDO	Description
6040h：Control Word	6041h：Status Word	Must

6060h：Modes of Operation	6061h：Modes of Operation Display	Optional
6071h：Target Torque		Must
	6064h：Position Actual Value	Optional
	606Ch：Velocity Actual Value	Optional
	6077h：Torque Actual Value	Optional
	603Fh：Error Code	Optional
	60FDh：Digital Inputs	Optional

5.1.9 Profile position mode（PP）

The profile position mode is mainly used for point-to-point positioning applications. In this mode, the host computer gives the target position (absolute or relative), the speed, acceleration and deceleration of the position curve, and the trajectory generator inside the servo will generate the target position curve command according to the setting. The position, speed and torque control are completed inside the driver.

Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0～Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
4	New Set-Point	This is the positive edge from 0 to 1, which means that the new target position 607Ah, profile velocity 6081h, acceleration 6083h, and deceleration 6084h are given for pre-trigger
5	Change Set Immediately	0：Non-immediate update 1：Update immediately
6	Absolute/Relative	0：The target position is an absolute position command 1：The target position is a relative position command
7	Reset Fault	0：No effect 1：Reset driver fault
8	Halt	0：Servo is set according to Bit0～Bit3 1：Servo pauses according to 605Dh setting

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target position is not reached 1：Target position reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
12	Set-Point Acknowledge	0：The slave does not follow the command 1：Slave follows the command
13	Following Error	0：There is no excessive position deviation fault 1：An excessive position deviation fault occurs
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
6040	00	Control word	Uint16	0～65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0～10	RW	8
6061	00	Mode display	Int16	-	RO	8
6062	00	Position command (unit: command unit)	Int32	-	RO	-
6063	00	Position feedback (unit: encoder unit)	Int32	-	RO	-
6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
6065	00	Threshold for excessive position deviation (unit: command unit)	Uint32	0～232-1	RW	393216
6067	00	Position reached threshold (unit: encoder unit)	Uint32	0～65535	RW	92
6068	00	Position reached time window (unit: ms)	Uint16	0～65535	RW	10

606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-
6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
607A	00	Target position (unit: command unit)	Int32	-231 ~ 231-1	RW	0
6081	00	Profile velocity (unit: command pulse/s)	Uint32	0 ~ 232-1		10000
6083	00	Profile acceleration (unit: command pulse/s2)	Uint32	0 ~ 232-1		10000
6084	00	Profile deceleration (unit: command pulse/s2)	Uint32	0 ~ 232-1		10000
6091	01	Gear ratio numerator	Uint32	1 ~ 231-1	RW	1
	02	Gear ratio denominator	Uint32	1 ~ 231-1	RW	1
60F4	00	Position deviation (unit: command unit)	Int32	-	RO	-
60FC	00	Position command (unit: encoder unit)	Int32	-	RO	-
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	03	Position loop gain	Uint16	0 ~ 50000	RW	800
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Related function settings

Positioning completion signal

Index (Hex)	Sub-index (Hex)	Name	Description
2006	07	Position reached threshold unit selection	Set the unit of 6067h: 0: Command unit 1: Encoder unit

6067	00	Position reached threshold	When the absolute value of the position deviation is within 6067h and the time reaches 6068h, the DO signal after positioning is valid, and 6041h.Bit10 is set to 1. If either of the two conditions is not met, the position arrival is invalid
6068	00	Position reached time window	

Threshold for excessive position deviation

Index (Hex)	Sub-index (Hex)	Name	Description
6065	00	Threshold for excessive position deviation	When the absolute value of the position deviation is greater than the set value, an excessive position deviation fault occurs, the driver LED panel will display AL.240, and the status word 6041h4.Bit13 is set to 1 When the set value is 0xFFFFFFFF, the driver will not detect excessive position deviation

Recommended configuration

RPDO	TPDO	Description
6040h：Control Word	6041h：Status Word	Must
607Ah：Target Position	6064h：Position Actual Value	Must
6060h：Modes of Operation	6061h：Modes of Operation Display	Optional
6081h：Profile Velocity		Must
6083h：Profile Acceleration		Optional
6084h：Profile Deceleration		Optional

5.1.10 Profile velocity mode（PV）

In this mode, the host computer sends the target speed, acceleration, and deceleration to the servo driver, and the speed and torque adjustments are executed internally by the servo.

Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0 ~ Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
4	New Set-Point	This is the positive edge from 0 to 1, which means that the new target position 607Ah, profile velocity 6081h, acceleration 6083h, and deceleration 6084h are given for pre-trigger
5	Change Set Immediately	0：Non-immediate update 1：Update immediately
6	Absolute/Relative	0：The target position is an absolute position command 1：The target position is a relative position command
7	Reset Fault	0：No effect 1：Reset driver fault
8	Halt	0：Servo is set according to Bit0 ~ Bit3 1：Servo pauses according to 605Dh setting

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target velocity is not reached 1：Target velocity reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
6040	00	Control word	Uint16	0 ~ 65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0 ~ 10	RW	8
6061	00	Mode display	Int16	-	RO	8
6063	00	Position feedback (unit:	Int32	-	RO	-

		encoder unit)				
6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-
6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
60FF	00	Profile velocity (unit: command pulse/s)	Uint32	0 ~ 232-1	RW	0
6091	01	Gear ratio numerator	Uint32	1 ~ 231-1	RW	1
	02	Gear ratio denominator	Uint32	1 ~ 231-1	RW	1
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Related function settings

Speed reached output function

Index (Hex)	Sub-index (Hex)	Name	Description
606D	00	Speed reached threshold	When the absolute value of the difference between the target velocity 60FF (converted into the unit of motor speed rpm) and the actual motor speed is within 606Dh, and the time set by 606Eh is maintained, the status word 6041h.bit10 is set to 1, and the speed reaches DO function is valid
606E	00	Speed reached time window	

Recommended configuration

RPDO	TPDO	说明
6040h：Control Word	6041h：Status Word	Must
6060h：Modes of Operation	6061h：Modes of Operation Display	Optional
60FFh：Target Velocity		Must

6083h：Profile Acceleration	6064h：Position Actual Value	Optional
6084h：Profile Deceleration	606Ch：Velocity Actual Value	Optional
	603Fh：Error Code	Optional
	60FDh：Digital Inputs	Optional

5.1.11 Profile torque mode（PT）

In this mode, the host computer sends the target torque 6071h and torque ramp constant 6087h to the servo drive, and the torque adjustment is executed internally by the servo driver. When the motor speed reaches the limit value, it will enter the speed regulation stage.
Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0～Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
7	Reset Fault	0：No effect 1：Reset driver fault

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target torque is not reached 1：Target torque reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
6040	00	Control word	Uint16	0～65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0～10	RW	8

6061	00	Mode display	Int16	-	RO	8
6063	00	Position feedback (unit: encoder unit)	Int32	-	RO	-
6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-
6071	00	Target torque (unit: 0.1%)	Int16	-3000 ~ 3000	RW	0
6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6074	00	Torque command (unit: 0.1%)	Int16	-5000 ~ 5000-	RO	-
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
60FF	00	Profile velocity (unit: command pulse/s)	Uint32	0 ~ 232-1	RW	0
6087	00	Torque ramp (unit: 0.1%/s)	Uint32	0 ~ 232-1	RW	3000
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Related function settings

Torque reached signal setting

Index (Hex)	Sub-index (Hex)	Name	Description
2008	0A	Reference value of torque reached	Reference value of torque reached：A Valid value of torque reached：B Invalid value of torque reached：C When: |Torque actual value|> |A + B|, the torque reached DO is valid, and the status word 6041h.bit10 is set to 1 When: |Torque actual value| <|A + C|, the torque
2008	0B	Valid value of torque reached	
2008	0C	Invalid value of torque reached	

			reached DO is invalid, and the status word 6041h.bit10 is cleared

Recommended configuration

RPDO	TPDO	Description
6040h：Control Word	6041h：Status Word	Must
6060h：Modes of Operation	6061h：Modes of Operation Display	Optional
6071h：Target Torque		Must
6087h：Torque Slope	6064h：Position Actual Value	Optional
607Fh：Profile Velocity	606Ch：Velocity Actual Value	Optional
	6077h：Torque Actual Value	Optional
	603Fh：Error Code	Optional
	60FDh：Digital Inputs	Optional

5.1.12 Homing mode（HM）

The homing mode is used to find the mechanical origin and locate the positional relationship between the mechanical origin and the mechanical zero point.

Mechanical origin: A fixed position on the machine can correspond to a certain origin switch or motor Z-phase signal.

Mechanical zero point: absolute zero position on the machine.

After the homing is completed, the motor stop position is the mechanical origin. By setting 607Ch, the relationship between the mechanical origin and the mechanical zero can be set:

Mechanical origin = mechanical zero + 607Ch (origin offset)

When 607Ch = 0, the mechanical origin coincides with the mechanical zero.

Related objects

Control word 6040h		
Bit	Name	Description
0	Switch On	When the values of Bit0 ~ Bit3 are all 1, the motor is enabled
1	Enable Voltage	
2	Quick Stop	
3	Enable Operation	
4	Home Start	0 -> 1：Start to home 1：Homing 1 -> 0：End homing
7	Reset Fault	0：No effect

		1：Reset driver fault
8	Halt	0：The servo is set according to Bit4 to determine whether to start homing 1：Servo pauses according to 605Dh setting

Status word 6041h		
Bit	Name	Description
10	Target Reached	0：The target position is not reached 1：Target position reached
11	Internal Limit Active	0：The position command and position feedback are not over limit 1：Position command or position feedback over limit
12	Homing Attained	0：Homing was unsuccessful 1：The homing is successful, this flag is valid after the servo is in the homing mode operation state (target reach signal) is set
13	Homing Error	0：No error occurred when homing 1：An error occurred when homing
15	Home Find	0：Homing is not completed 1：Homing completed

Index (Hex)	Sub-index (Hex)	Name	Data type	Setting range	Access type	Default value
6040	00	Control word	Uint16	0～65535	RW	0
6041	00	Status word	Uint16	-	RO	0
6060	00	Operation mode	Int16	0～10	RW	8
6061	00	Mode display	Int16	-	RO	8
6062	00	Position command (unit: command unit)	Int32	-	RO	-
6063	00	Position feedback (unit: encoder unit)	Int32	-	RO	-
6064	00	Position feedback (unit: command unit)	Int32	-	RO	-
6065	00	Threshold for excessive position deviation (unit: command unit)	Uint32	0～232-1	RW	393216

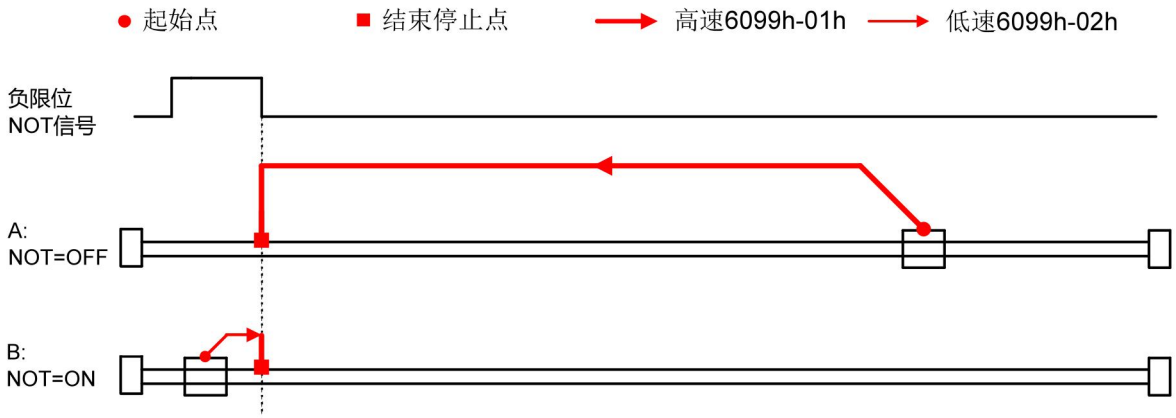
6067	00	Position reached threshold (unit: encoder unit)	Uint32	0 ~ 65535	RW	92
6068	00	Position reached time window (unit: ms)	Uint16	0 ~ 65535	RW	10
606C	00	Actual speed (unit: command unit/s)	Int32	-	RO	-
6072	00	Maximum torque (unit: 0.1%)	Uint16	0 ~ 3000	RW	3000
6077	00	Actual torque (unit: 0.1%)	Int16	-5000 ~ 5000	RO	-
6091	01	Gear ratio numerator	Uint32	1 ~ 231-1	RW	1
	02	Gear ratio denominator	Uint32	1 ~ 231-1	RW	1
6099	01	Search deceleration point signal speed (unit: command unit/s)	Uint32	1 ~ 231-1	RW	10000
	02	Search origin signal speed (unit: command unit/s)	Uint32	1 ~ 231-1	RW	2000
609A	00	Acceleration (unit: command unit/s2)	Uint32	0 ~ 232-1	RW	100000
60F4	00	Position deviation (unit: command unit)	Int32	-	RO	-
2009	01	Speed loop gain	Uint16	0 ~ 50000	RW	4000
	02	Speed loop integration time	Uint16	1 ~ 30000	RW	1500
	03	Position loop gain	Uint16	0 ~ 50000	RW	800
	0F	Torque loop gain	Uint16	0 ~ 50000	RW	800
	10	Torque loop integral time	Uint16	1 ~ 10000	RW	500

Introduction to home：

Object 6098h = 17

Mechanical origin: reverse limit switch

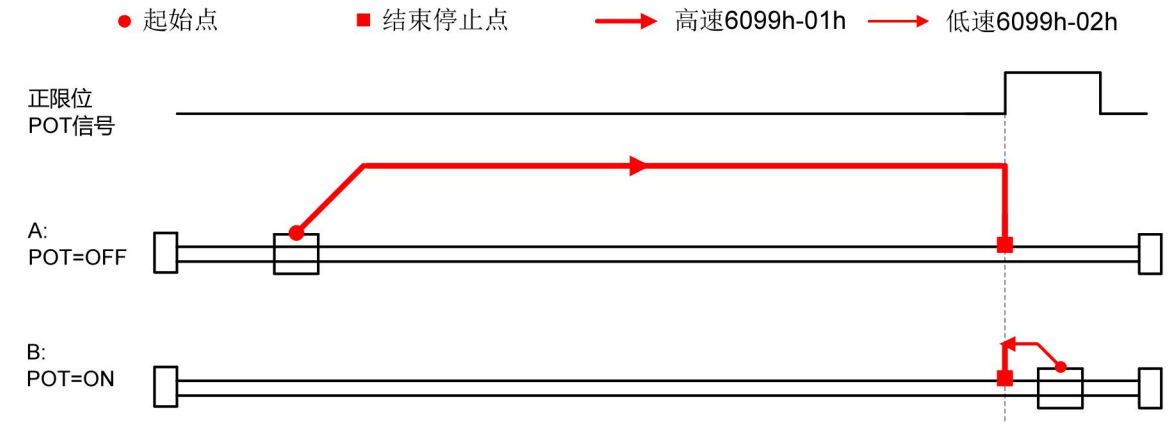
Deceleration point: Reverse limit switch



Object 6098h = 18

Origin: Forward limit switch

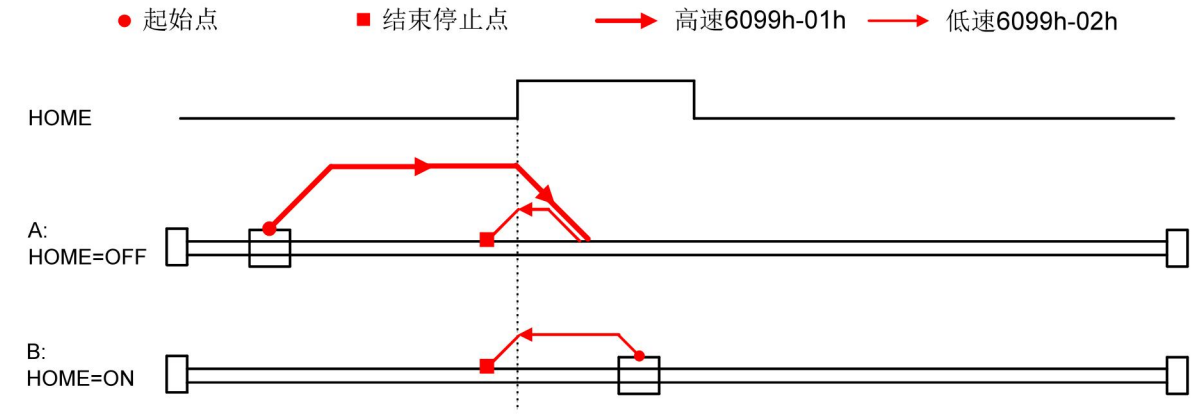
Deceleration point: Forward limit switch



Object 6098h = 19

Origin: Origin switch

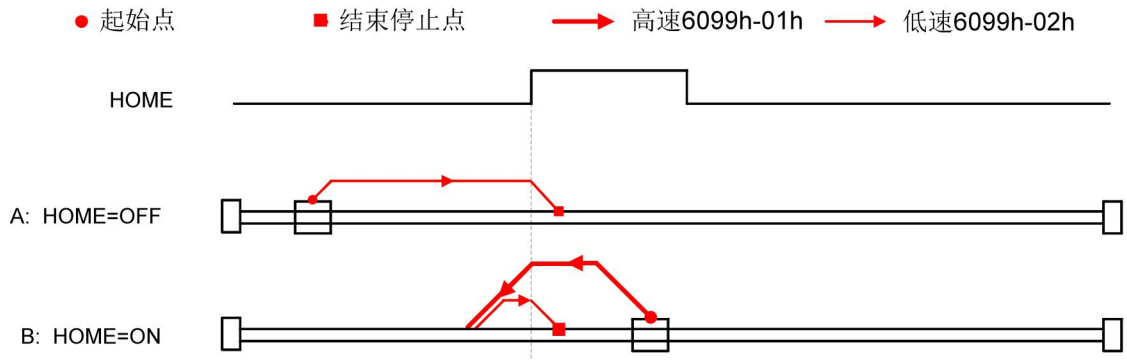
Deceleration point: Origin switch



Object 6098h = 20

Origin: Origin switch

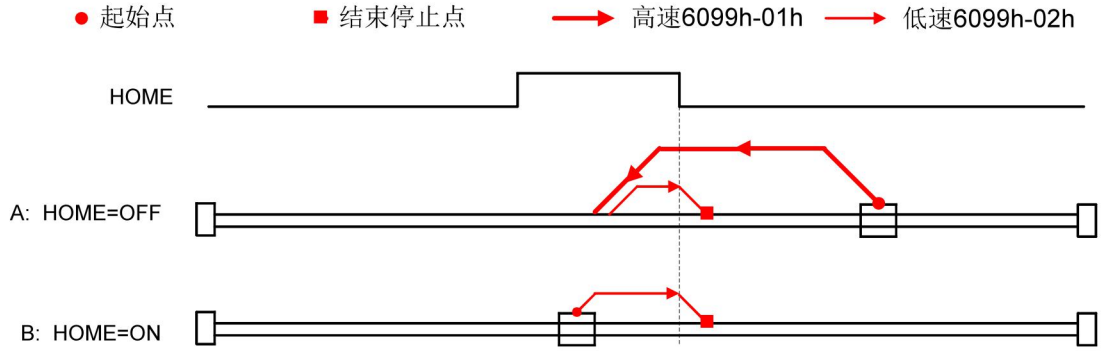
Deceleration point: Origin switch



Object 6098h = 21

Origin: Origin switch

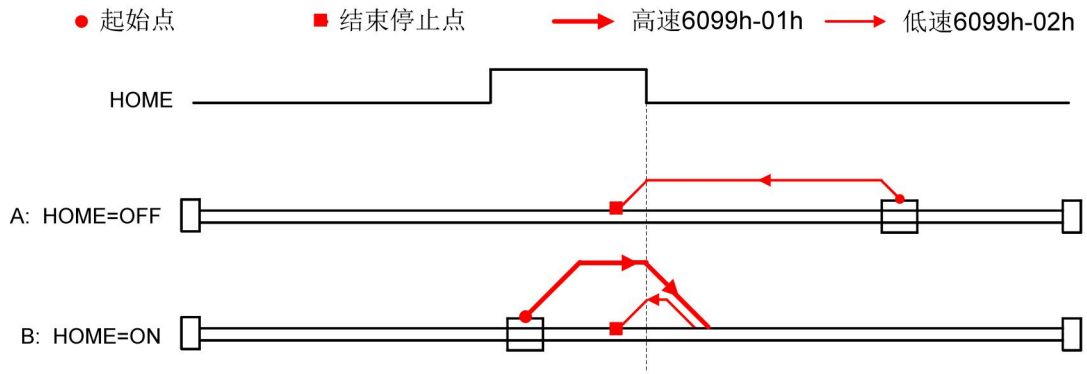
Deceleration point: Origin switch



Object 6098h = 22

Origin: Origin switch

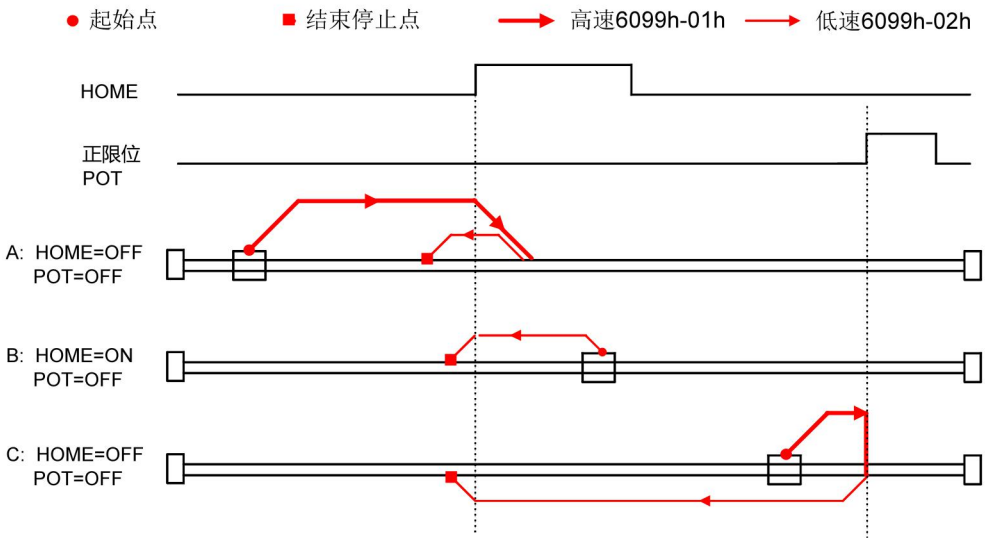
Deceleration point: Origin switch



Object 6098h = 23

Origin: Origin switch

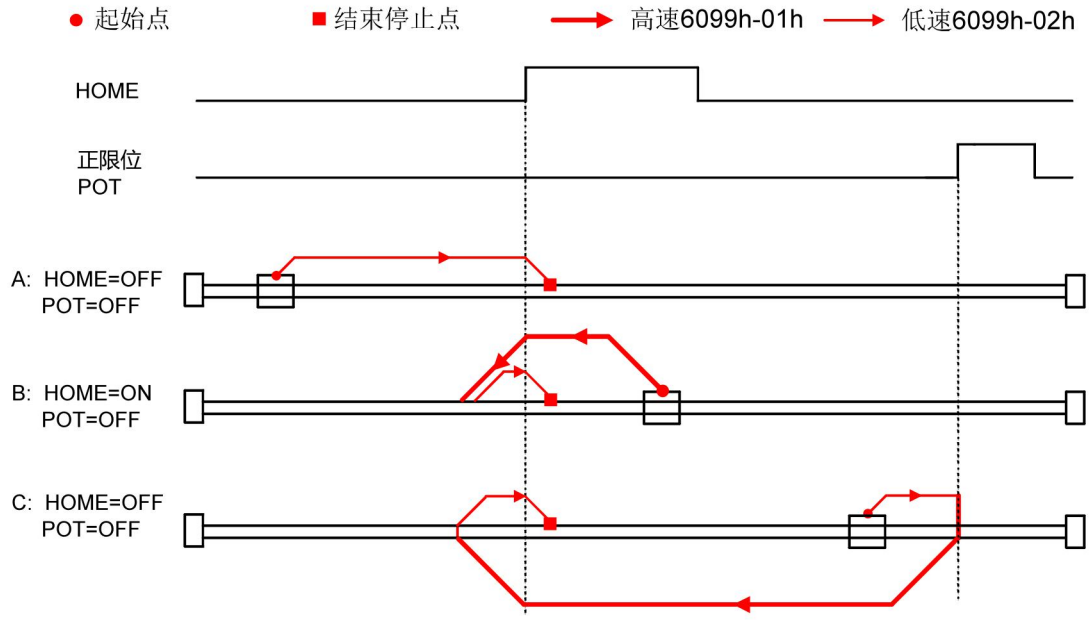
Deceleration point: Origin switch



Object 6098h = 24

Origin: Origin switch

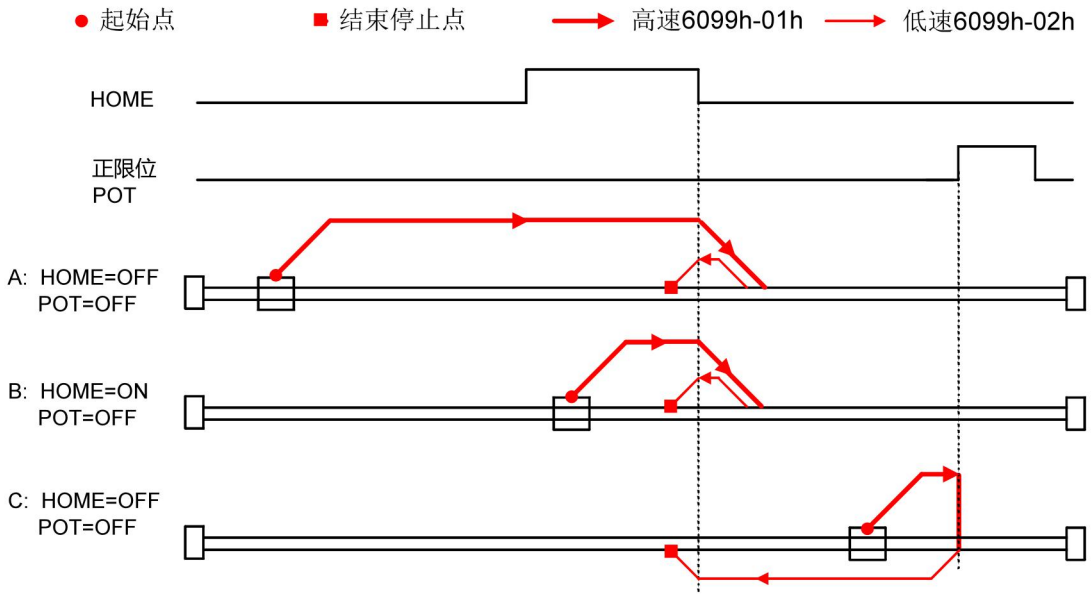
Deceleration point: Origin switch



Object 6098h = 25

Origin: Origin switch

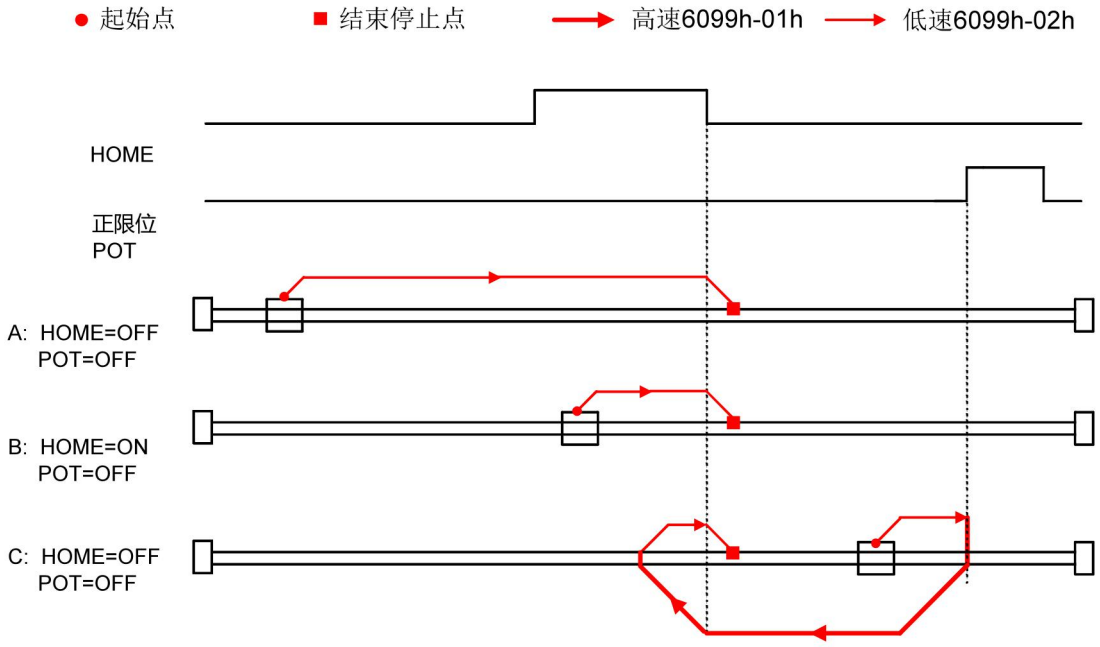
Deceleration point: Origin switch



Object 6098h = 26

Origin: Origin switch

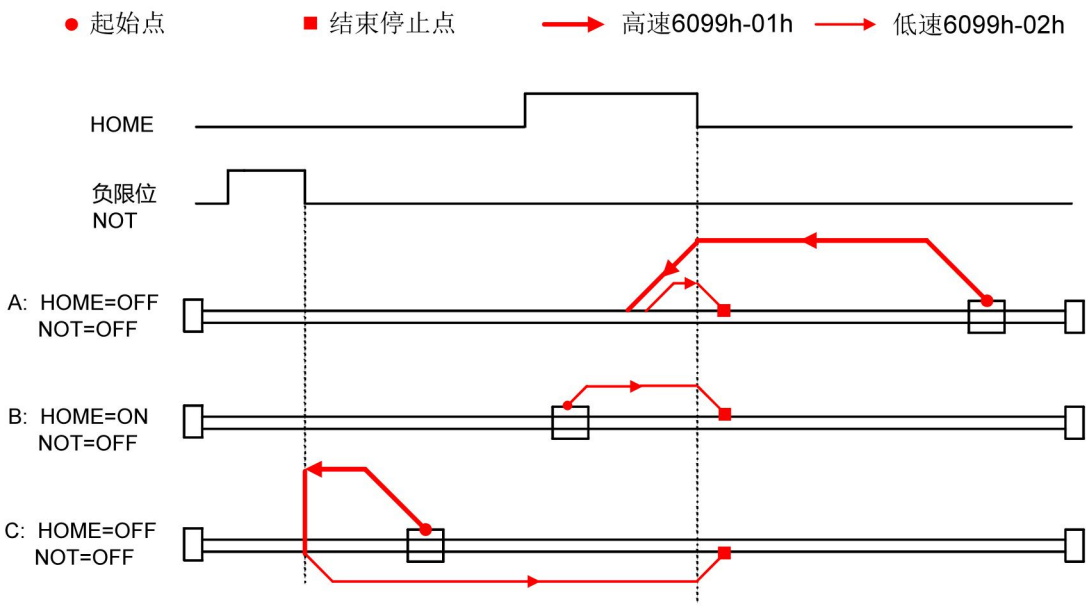
Deceleration point: Origin switch



Object 6098h = 27

Origin: Origin switch

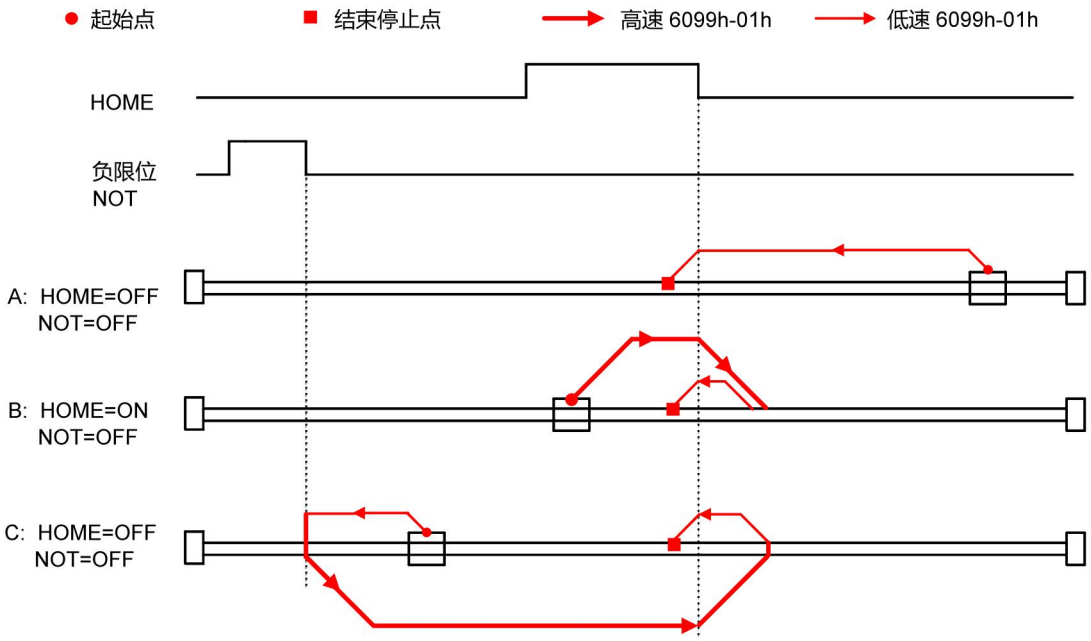
Deceleration point: Origin switch



Object 6098h = 28

Origin: Origin switch

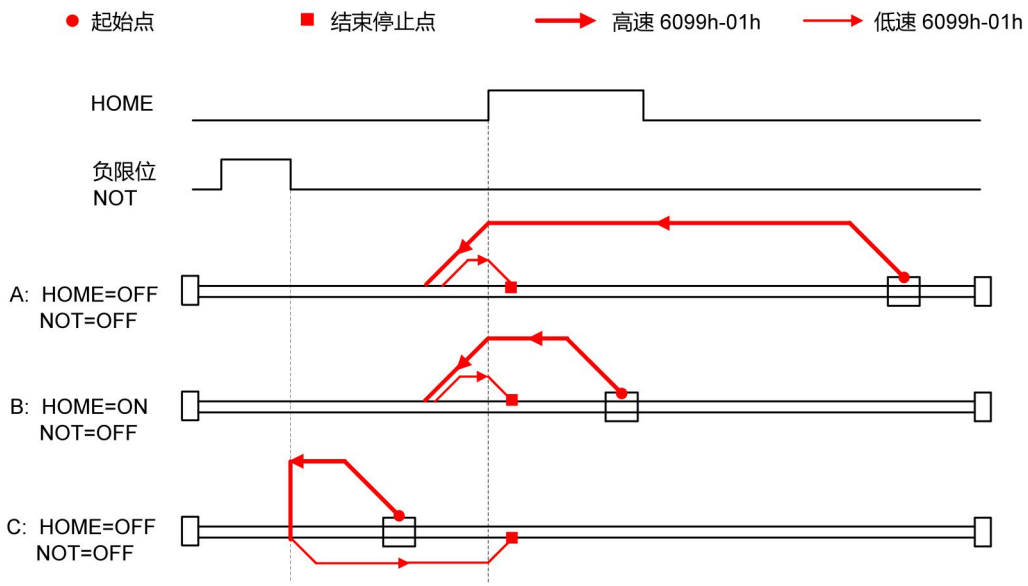
Deceleration point: Origin switch



Object 6098h = 29

Origin: Origin switch

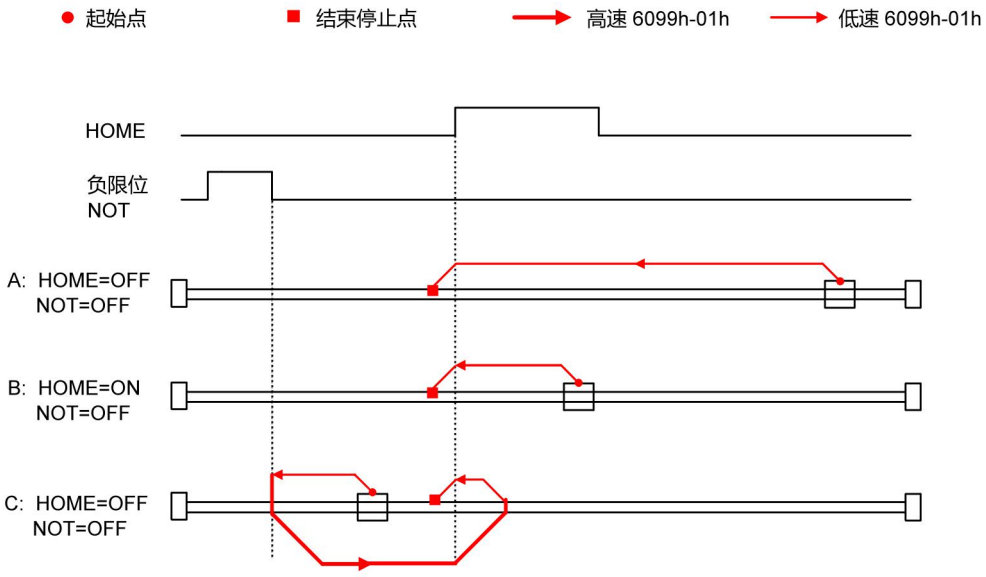
Deceleration point: Origin switch



Object 6098h = 30

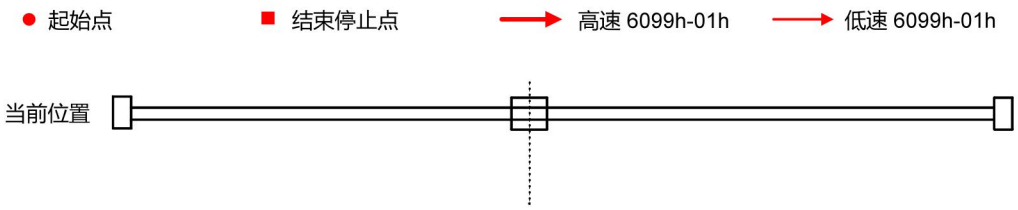
Origin: Origin switch

Deceleration point: Origin switch



Object 6098h = 35

Taking the current position as the mechanical origin, after triggering the homing (6040h control word: 0x0F -> 0x1F), the position feedback 6064h is set to the origin offset 607Ch.



Recommended configuration

RPDO	TPDO	Description
6040h：Control Word	6041h：Status Word	Must
6060h：Modes of Operation	6061h：Modes of Operation Display	Optional
6098h：Homing Method		Optional
6099-01h：Speed during search for switch		Optional
6099-02h：Speed during search for zero	603Fh：Error Code	Optional
609Ah：Homing acceleration	60FDh：Digital Inputs	Optional

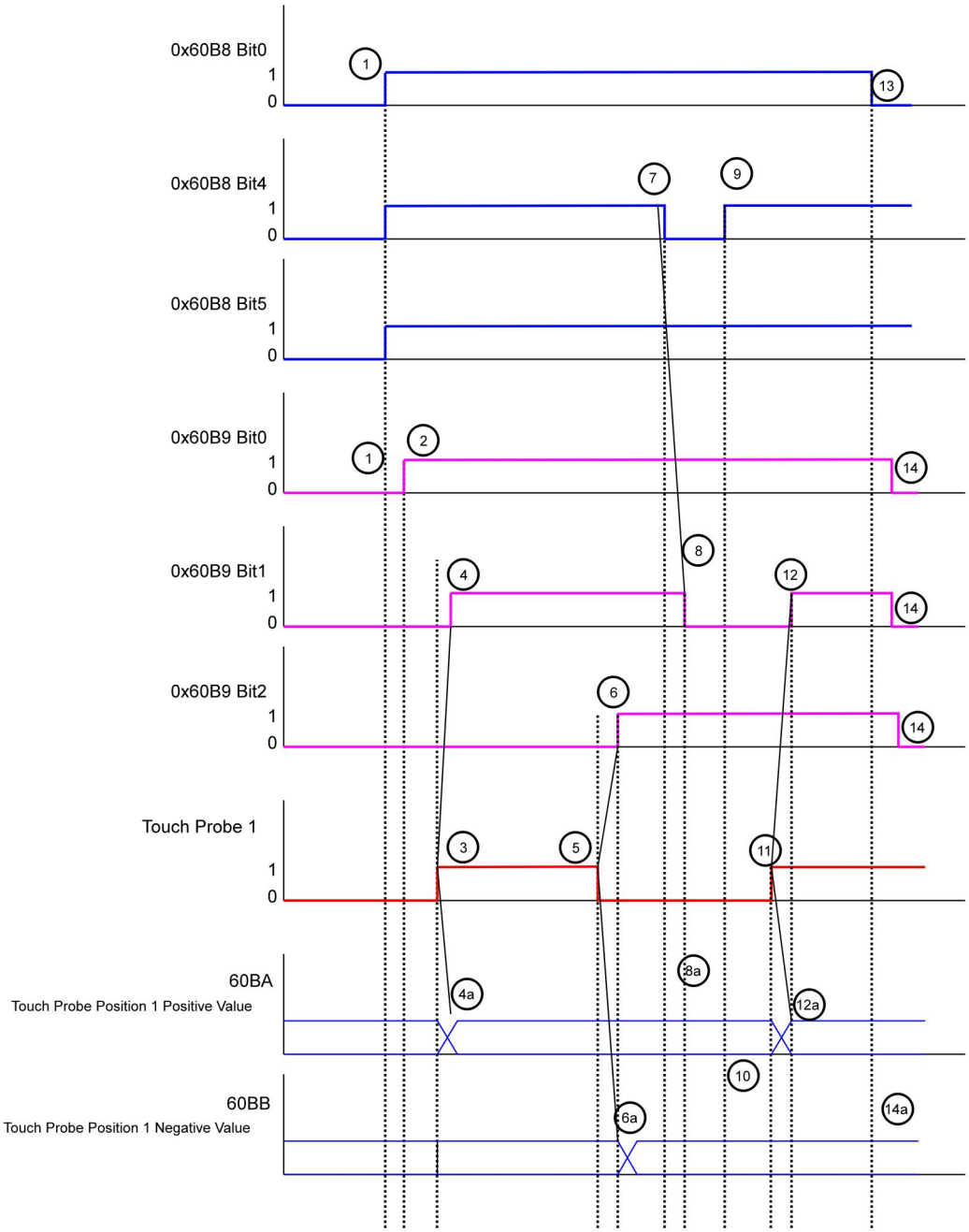
5.1.13 Accessibility introduction

Probe function

The probe function latches the motor position information through the digital input port. The function and polarity of RSE's digital input port can be defined by index 0x2004.

The relevant object dictionary of the probe function is as follows:

Index	Object description
0x60B8	Touch Probe Function
0x60B9	Touch Probe Status
0x60BA	Touch Probe Position 1 Positive Value
0x60BB	Touch Probem Position 1 Negative Value
0x60BC	Touch Probe Position 2 Positive Value
0x60BD	Touch Probe Position 2 Negative Value



Probe timing diagram

No.	Register changes	Probe action
1	60B8 Bit 0 = 1 60B8 Bit 1,4,5	Enable probe 1 Configure the positive edge and negative edge of the enable probe
2	-> 60B9 Bit 0 = 1	The state "probe 1 enabled" is set
3	External probe signal positive edge	
4	-> 60B9 Bit 1 = 1	The state "Probe 1 positive edge latch" is set
4a	-> 60BA	The positive position of probe 1 is latched
5	External probe signal negative edge	
6	-> 60B9 Bit 2 = 1	The state "Probe 1 negative edge latch" is set
6a	-> 60BB	The negative position of probe 1 is latched

7	-> 60B8 Bit：4	Positive edge latch function: prohibited
8	-> 60B9 Bit 0 = 0	The status "Probe 1 positive edge latch" is cleared
8a	-> 60BA	The probe 1 is in the positive position, and the latch position has not changed
9	-> 60B8 Bit 4 = 1	Positive edge latch function: enable
10	-> 60BA	The probe 1 is in the positive position, and the latch position has not changed
11	xternal probe signal positive edge	
12	-> 60B9 Bit 1 = 1	The state "Probe 1 positive edge latch" is set
12a	-> 60BA	The positive position of probe 1 is latched
13	-> 60B8 Bit 0 = 0	Probe 1 function: prohibit
14	-> 60B9 Bit 0,1,2 = 0	The status bit is cleared
14a	-> 60BA,60BB	There is no change in the positive/negative latch position of probe 1

6. Detailed Description of the Object Dictionary

6.1 Classification description of the object dictionary

The object dictionary is the most important part of the device specification. It is an ordered collection of a set of parameters and variables, including all parameters of device description and device network status. A set of objects that can be accessed in an orderly and predefined way through the network.

EtherCAT adopt an object dictionary with 16-bit index and 8-bit sub-index. The structure of the object dictionary is shown in the following table.

Index	Object
0000h	Unused
0001h ~ 001Fh	Static data types (standard data types, such as Boolean, Integer16)
0020h ~ 003Fh	Complex data types (predefined structures composed of simple types such as PDOCommPar, SDOParmete)
0040h ~ 005Fh	Complex data types specified by the manufacturer
0060h ~ 007Fh	Static data type specified by the device sub-protocol
0080h ~ 009Fh	Complex data types specified by the device sub-protocol
00A0h ~ 0FFFh	Reserve
1000h ~ 1FFFh	Communication sub-protocol area (such as device type, error

	register, number of supported PDOs)
2000h ~ 5FFFh	Manufacturer-specific sub-protocol area (such as function code mapping)
6000h ~ 9FFFh	Standard equipment sub-protocol area (such as DSP-402 protocol)
A000h ~ FFFFh	Reserve

The object in RS EtherCAT contains the following attributes:

Index	Data structure	Mapped	Related mode	Factory setting
Sub-index	Data type	Accessibility	Data range	Settings effective

Noun Interpretation

The position of the object dictionary in the parameter table is specified by "index" and "sub-index".

"Index": Specify the position of the same type of object in the object dictionary, expressed in hexadecimal.

"Sub-index": Under the same index, it contains multiple objects, and the offset of each object under this category.

The description of each object in the object dictionary is described by category.

For example, there is an object 6091h for electronic gear ratio setting in the object dictionary, which describes the numerator and denominator of the electronic gear ratio respectively. The objects are defined as follows:

Index	Sub-index	Name	Meaning
6091h	00h	Number of elements	The number of object data, not including itself
6091h	01h		Numerator of electronic gear ratio
6091h	02h		Denominator of electronic gear ratio

“Data structure”：

Category	Meaning	DS301 Value
VAR	A single simple value, including data types Int8, Uint16, String, etc.	7
ARR	There are same types of data blocks	8
REC	There are different types of data blocks	9

“Data type”:

Data type	Numerical range	Data length	DS301Value
Int8	-128 ~ +127	1 byte	0002
Int16	-32768 ~ +32767	2 byte	0003
Int32	-2147483648 ~ +2147483647	4 byte	0004
Uint8	0 ~ 255	1 byte	0005
Uint16	0 ~ 65535	2 byte	0006
Uint32	0 ~ 4294967295	4 byte	0007
String	ASCII	-	0009

“Accessibility”:

Accessibility	Description
RW	Can read and write
WO	Write only
RO	Read only

“Mapped”:

Mapped	Description
NO	Not mapped in PDO
RPDO	Can be used as RPDO
TPDO	Can be used as TPDO

“Related modes”:

Related modes	Description
-	The parameter has nothing to do with the control mode
ALL	Parameters are related to all control modes
PP/PV/PT/HM/CSP/CSV/CST	Parameters are related in the corresponding mode

"Data range": The upper and lower limits of data for parameters with writable attributes.

"Factory setting": Default value of factory parameters

6.2 Detailed description of communication parameters (1000h group)

Index 1000h	Name	Equipment type					Data structure	VAR	Data type	Uint32
	Data range	-	Factory setting	0x00020192	Access ibility	RO	Related modes	-	Mapped	NO
	Describe the sub-protocol type of CoE equipment									

Bit	Name	Description
0 ~ 15	Device sub-protocol	402（192h）：Device sub-protocol
16 ~ 23	Types	02：Servo driver
25 ~ 31	Mode	Manufacturer custom

Index 1008h	Name	Manufacturer equipment name					Data structure	-	Data type	-
	Data range	-	Factory setting	Model decision	Acces sibility	RO	Related modes	-	Mapped	NO

Index 1009h	Name	Manufacturer hardware version					Data structure	-	Data type	-
	Data range	-	Factory setting	Version decision	Acces sibility	RO	Related modes	-	Mapped	NO

Index 100Ah	Name	Manufacturer software version					Data structure	-	Data type	-
	Data range	-	Factory setting	Version decision	Acces sibility	RO	Related modes	-	Mapped	NO

Index 1018h	Name	ID object					Data structure	REC	Data type	OD type
	Data range	-	Factory setting	OD default value	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 00h	Name	The largest sub-index number contained in the ID object					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	4	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Vendor ID					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x0A880000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 02h	Name	Product code					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x00100000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 03h	Name	Amendment No					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x00010A88	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 04h	Name	Product Serial Number					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x00000000	Accessibility	RO	Related modes	-	Mapped	NO

Index 1600h	Name	RPDO1 mapping object					Data structure	REC	Data type	Uint8
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Number of mapping objects supported by RPDO1					Data structure	-	Data type	Uint8
	Data range	0 ~ 12	Factory setting	3	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	The first mapping object					Data structure	-	Data type	Uint8
	Data range	0 ~ 4294967295	Factory setting	0x60400010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 02h	Name	The second mapping object					Data structure	-	Data type	Uint8
	Data range	0 ~ 4294967295	Factory setting	0x607A0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 03h	Name	The third mapping object					Data structure	-	Data type	Uint8
	Data range	0 ~ 4294967295	Factory setting	0x60B80010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 04 ~ 0Ch	Name	4th to 12th mapping objects					Data structure	-	Data type	Uint8
	Data range	0 ~ 4294967295	Factory setting	-	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 1601h	Name	RPDO2 mapping object					Data structure	REC	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Number of mapping objects supported by RPDO2					Data structure	-	Data type	Uint8
	Data range	0 ~ 12	Factory setting	6	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	The first mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60400010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 02h	Name	The second mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x607A0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 03h	Name	The third mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60810020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 04h	Name	The fourth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60830020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 05h	Name	The fifth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60840020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 06h	Name	The sixth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60600008	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 07~0Ch	Name	7th to 12th mapping objects					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	-	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 1602h	Name	RPDO3 mapping object					Data structure	REC	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Number of mapping objects supported by RPDO3					Data structure	-	Data type	Uint8
	Data range	0 ~ 12	Factory setting	5	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	The first mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60400010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 02h	Name	The second mapping object	Data structure	-	Data type	Uint32

	Data range	0 ~ 4294967295	Factory setting	0x60830020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 03h	Name	The third mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60840020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 04h	Name	The fourth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60FF0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 05h	Name	The fifth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60600008	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 06~0Ch	Name	6th to 12th mapping objects					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	-	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 1A00h	Name	TPDO1 mapping object					Data structure	REC	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Number of mapping objects supported by TPDO1					Data structure	-	Data type	Uint8
	Data range	0 ~ 12	Factory setting	7	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	The first mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967	Factory setting	0x603F0010	Accessibility	RW	Related modes	ALL	Mapped	NO

		295								

Sub-index 02h	Name	The second mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60410010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 03h	Name	The third mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60610008	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 04h	Name	The fourth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60640020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 05h	Name	The fifth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60B90010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 06h	Name	The sixth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60BA0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 07h	Name	The seventh mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60FD0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 08 ~ 0Ch	Name	8th to 12th mapping objects					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	-	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 1A00h	Name	TPDO2 mapping object					Data structure	REC	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Number of mapping objects supported by TPDO2					Data structure	-	Data type	Uint8
	Data range	0 ~ 12	Factory setting	4	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	The first mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60410010	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 02h	Name	The second mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60610008	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 03h	Name	The third mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x606C0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 04h	Name	The fourth mapping object					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	0x60FD0020	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 05 ~ 0Ch	Name	5th to 12th mapping objects					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	-	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 1A00h	Name	TPDO3 mapping object					Data structure	REC	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Acces sibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Number of mapping objects supported by TPDO3					Data structure	-	Data type	Uint8
	Data range	0 ~ 12	Factory setting	0	Acces sibility	RW	Related modes	ALL	Mapped	NO

Sub-index 00~0Ch	Name	The 1st to 12th mapping objects					Data structure	-	Data type	Uint32
	Data range	0 ~ 4294967295	Factory setting	-	Acces sibility	RW	Related modes	ALL	Related modes	NO

Index 1C00h	Name	Synchronous management communication type					Data structure	REC	Data type	OD type
	Data range	OD data range	Factory setting	OD default value	Access ibility	RO	Related modes	-	Mapped	NO

Sub-index 00h	Name	The largest sub-index number of the synchronous management communication type					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	4	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	SM0 communication type					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	0x01	Acces sibility	RO	Related modes	-	Mapped	NO
SM0 communication type: receiving mailbox										

Sub-index 02h	Name	SM1 communication type					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	0x02	Access ibility	RO	Related modes	-	Mapped	NO
SM1 communication type: send mailbox										

Sub-index 03h	Name	SM2 communication type					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	0x03	Accessibility	RO	Related modes	-	Mapped	NO
SM2 communication type: process data output										

Sub-index 04h	Name	SM3 communication type					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	0x04	Accessibility	RO	Related modes	-	Mapped	NO
SM3 communication type: process data input										

Index 1C12h	Name	Sync Manager 2 RPDO distribution					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	-	Mapped	NO
Set the object index allocated by RPDO										

Sub-index 00h	Name	The largest sub-index number assigned by synchronization manager 2 RPDO					Data structure	-	Data type	Uint8
	Data range	0 ~ 1	Factory setting	1	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	RPDO assigned object index					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0x1600	Accessibility	RW	Related modes	-	Mapped	NO
Set the object index allocated by RPDO										

Index 1C13h	Name	Sync Manager 3 TPDO distribution					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	RW	Related modes	-	Mapped	NO
Set the object index allocated by TPDO										

Sub-index 00h	Name	The largest sub-index number assigned by synchronization manager 3 TPDO					Data structure	-	Data type	Uint8
	Data range	0 ~ 1	Factory setting	1	Accessibility	RW	Related modes	ALL	Mapped	NO

Sub-index 01h	Name	TPDO assigned object index					Data structure	-	Data type	Uint16
	Data range	0～65535	Factory setting	0x1A00	Accessibility	RW	Related modes	-	Mapped	NO
Set the object index allocated by TPDO										

Index 1C32h	Name	Synchronization Manager 2 synchronization output parameters					Data structure	REC	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	RO	Related modes	-	Mapped	NO
Describe the output parameters of SM2										

Sub-index 00h	Name	The synchronization manager 2 synchronously outputs the maximum sub-index number of the parameter.					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	32	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Synchronization type					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	2	Accessibility	RO	Related modes	-	Mapped	NO
0x0002 indicates that the synchronization type of SM2 is distributed clock synchronization 0 mode (DC SYNC Mode)										

Sub-index 02h	Name	Cycle time (unit: ns)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x003D0900	Accessibility	RO	Related modes	-	Mapped	NO
Reflect the period of DC SYNC 0										

Sub-index 04h	Name	Supported synchronization types					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	0x401F	Accessibility	RO	Related modes	-	Mapped	NO
Reflect the type of distributed clock: 0x0004 represents the distributed clock synchronization 0 mode (DC SYNC 0 Mode)										

Sub-index 05h	Name	Minimum cycle time (unit: ns)					Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0xE8480000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 06h	Name	Calculation and copy time (unit: ns)				Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	-	Mapped	NO
Reflects the time when the microprocessor copies data from the synchronization manager to the local.									

Sub-index 09h	Name	Delay time (unit: ns)				Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 20h	Name	Sync error				Data structure	-	Data type	Bool
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	-	Mapped	NO
Reflect whether a synchronization error occurs currently: TRUE: synchronization is activated and no synchronization error occurs FALSE: Synchronization is not activated or a synchronization error has occurred									

Index 1C33h	Name	Synchronization management 3 synchronization input parameters				Data structure	REC	Data type	OD type
	Data range	OD data range	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO
Describe the input parameters of SM3									

Sub-index 00h	Name	The synchronization manager 3 synchronously inputs the maximum sub-index number of the parameter.				Data structure	-	Data type	Uint8
	Data range	-	Factory setting	32	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Synchronization type				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	2	Accessibility	RO	Related modes	-	Mapped	NO
0x0002 indicates that the synchronization type of SM2 is distributed clock synchronization mode (DC SYNC 0 Mode)									

Sub-index 01h	Name	Cycle time (unit: ns)				Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x003D0900	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 04h	Name	Supported synchronization types				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	0x401F	Accessibility	RO	Related modes	-	Mapped	NO
Reflect the type of distributed clock: 0x0004 represents the distributed clock synchronization 0 mode (DC SYNC 0 Mode)										

Sub-index 05h	Name	Minimum cycle time (unit: ns)				Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0xE8480000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 06h	Name	Calculation and copy time (unit: ns)				Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x00000001	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 09h	Name	Delay time (unit: ns)				Data structure	-	Data type	Uint32
	Data range	-	Factory setting	0x0000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 20h	Name	Sync error				Data structure	-	Data type	Bool
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

6.3 Detailed description of manufacturer-defined parameters (2000h group)

6.3.1 Servo motor parameters

Index 2000h	Name	Servo motor parameters					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	-	Mapped	NO

Sub-index 00h	Name	Maximum sub-index number				Data structure	-	Data type	Uint8
	Data range	-	Factory setting	14	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Motor ID				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 02h	Name	Motor rated power (unit: 0.01KW)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 03h	Name	Motor rated voltage (unit: V)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 04h	Name	Motor rated current (unit: 0.1A)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 05h	Name	Motor rated speed (unit: rpm)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 06h	Name	Maximum motor speed (unit: rpm)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 07h	Name	Motor rated torque (unit: 0.01Nm)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 08h	Name	Maximum torque of motor (unit: 0.01Nm)				Data structure	-	Data type	Uint16

	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 09h	Name	Motor rotor inertia (unit: 0.01Kg.cm)					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Ah	Name	Number of motor pole pairs (unit: poles)					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Bh	Name	Motor wire resistance（unit：0.001Ω）					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Ch	Name	Motor Q axis inductance（unit：0.01mH）					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Dh	Name	Motor D axis inductance（unit：0.01mH）					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Eh	Name	Motor torque constant（unit：0.01Nm/A）					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	Model setting	Acces sibility	RW	Related modes	-	Mapped	NO

6.3.2 Driver parameters

Index 2001h	Name	Driver parameters					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Acces sibility	-	Related modes	-	Mapped	NO

Sub-index 00h	Name	Maximum sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	3	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	MCU software version number					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 02h	Name	FPGA software version number					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 03h	Name	EtherCAT software version number					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

6.3.3 Encoder parameters

Index 2002h	Name	Encoder parameters					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	-	Mapped	NO

Sub-index 00h	Name	Maximum sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	10	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Encoder type					Data structure	-	Data type	Uint16
	Data range	0 ~ 2	Factory setting	2	Accessibility	RW	Related modes	-	Mapped	NO
Set the encoder type: 0: reserved 1: Multi-turn absolute encoder 2: Single-turn absolute encoder										

Sub-index 02h	Name	Motor encoder zero offset					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 03h	Name	Encoder resolution (unit: bit)					Data structure	-	Data type	Uint16
	Data range	0 ~ 23	Factory setting	17	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 04h	Name	Prohibit multi-turn absolute encoder battery failure alarm					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 05h	Name	Multi-turn absolute encoder coil resolution (unit: bit)					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	16	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 06h	Name	Motor power-on and lock shaft torque (unit: %)					Data structure	-	Data type	Uint16
	Data range	0 ~ 300	Factory setting	90	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 07h	Name	Set the current position of the multi-turn absolute encoder as zero					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 08h	Name	Multi-turn absolute encoder zero point single-turn offset					Data structure	-	Data type	Uint32
	Data range	0 ~ 8388607	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 09h	Name	Multi-turn absolute encoder zero point multi-turn offset					Data structure	-	Data type	Int32
	Data range	-32768 ~ 32767	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 0Ah	Name	Prohibit the encoder position to update the current position command	Data structure	-	Data type	Uint16

	Data range	0 ~ 1	Factory setting	0	Acces sibility	RW	Related modes	-	Mapped	NO

6.3.4 Basic control parameters

Inedx 2003h	Name	Basic control parameters					Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Acces sibility	-	Related modes	ALL	Mapped	NO

Sub-index 00h	Name	Maximum Sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	16	Access ibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Control mode					Data structure	-	Data type	Uint16
	Data range	0 ~ 3	Factory setting	3	Access ibility	RW	Related modes	ALL	Mapped	NO
Set the drive control mode: 0: Position control mode 1: Speed control mode 2：Torque control mode 3：EtherCAT control mode										

Sub-index 02h	Name	Direction selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Access ibility	RW	Related modes	ALL	Mapped	NO
Set the positive direction of the motor: 0: Regard the CCW direction as the forward rotation direction (when the forward direction is commanded, the motor rotation direction is the CCW direction, that is, counterclockwise rotation when viewed from the motor shaft side) 1: Regard the CW direction as the forward rotation direction (when the command is in the forward direction, from the side of the motor shaft, the motor rotation direction is the CW direction, that is, clockwise rotation)										

Sub-index 03h	Name	The minimum value of braking resistance allowed by the drive (unit: Ω)					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	30	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 04h	Name	Built-in braking resistor power (unit: W)				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	40	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 05h	Name	Built-in braking resistor resistance (unit: Ω)				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	200	Access ibility	RO	Related modes	-	Mapped	NO

Sub-index 06h	Name	Heat dissipation coefficient of braking resistor (unit: %)				Data structure	-	Data type	Uint16
	Data range	0 ~ 100	Factory setting	20	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 07h	Name	Braking resistance setting				Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Acces sibility	RW	Related modes	-	Mapped	NO
0：Use built-in resistor 1：Use external resistor										

Sub-index 08h	Name	External braking resistor power (unit: W)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	100	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 09h	Name	Resistance of external braking resistor (unit: Ω)				Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	50	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Ah	Name	Brake start voltage threshold (unit: V)				Data structure	-	Data type	Uint16
	Data range	150 ~ 390	Factory setting	370	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Bh	Name	Prohibit brake feedback detection mode				Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Acces sibility	RW	Related modes	-	Mapped	NO

Sub-index 0Ch	Name	The longest continuous braking time (unit: ms)					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	3000	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 0Dh	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 0Eh	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 0Fh	Name	Delay time from Brake output OFF to motor not energized (unit: ms)					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	50	Accessibility	RW	Related modes	-	Mapped	NO

Sub-index 10h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

6.3.5 Input terminal parameters

Inedx 2004h	Name	Input terminal parameters					Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Accessibility	-	Related modes	-	Mapped	YES

Sub-index 00h	Name	Maximum Sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	16	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	IN1 terminal function selection					Data structure	-	Data type	Uint16
	Data	0 ~ 31	Factory	0	Acces	RW	Related	-	Mapped	YES

	range		setting		sibility		modes			

Set the function of the digital input terminal 1 of the drive.。

Set value	IN OUT terminal function	Set value	IN OUT terminal function
0	FunIN.0：Normal input	15	FunIN.15：Torque command direction setting 2
1	FunIN.1：Servo enable	16	FunIN.16：Torque command direction setting 3
2	FunIN.2：Alarm clear	17	FunIN.17：Torque command direction setting 4
3	FunIN.3：Pulse command prohibition	18	FunIN.18：Torque command direction setting
4	FunIN.4：Clear position deviation	19	FunIN.19：Speed command direction setting
5	FunIN.5：Positive limit signal	20	FunIN.20：Position command direction setting
6	FunIN.6：Negative limit signal	21	FunIN.21：Multi-segment position command enable
7	FunIN.7：Gain switching	22	FunIN.22：Origin return start
8	FunIN.8：Electronic gear ratio switch	23	FunIN.23：Origin switch signal
9	FunIN.9：Reserve	24	FunIN.24：USER1
10	FunIN.10：Reserve	25	FunIN.25：USER2
11	FunIN.11：Emergency stop	26	FunIN.26：USER3
12	FunIN.12：Position command prohibition	27	FunIN.27：USER4
13	FunIN.13：Step position trigger	28	FunIN.28：USER5
14	FunIN.14：Torque command direction setting 1	29	FunIN.29：USER6

Sub-index 02h	Name	IN1 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0～1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Set the level logic of the hardware IN1 terminal when the IN1 function is valid. Please set the effective level logic correctly according to the host computer and peripheral circuit.

Set value	IN terminal logic when IN function is valid
0	Low pegel
1	High pegel

Sub-index 03h	Name	IN2 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	30	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 04h	Name	IN2 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 05h	Name	IN3 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	31	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 06h	Name	IN3 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 07h	Name	IN4 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	5	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 08h	Name	IN4 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 09h	Name	IN5 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	6	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 0Ah	Name	IN5 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 0Bh	Name	IN6 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	23	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 0Ch	Name	IN6 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 0Dh	Name	IN7 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 0Eh	Name	IN7 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 0Fh	Name	IN8 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	11	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 10h	Name	IN8 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

6.3.6 Output terminal parameters

Inedx 2005h	Name	Output terminal parameters					Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Accessibility	-	Related modes	-	Mapped	YES

Sub-index 00h	Name	Maximum Sub-index number					Data structure	-	Data type	Uint8
	Data	-	Factory	8	Acces	RO	Related	-	Mapped	NO

	range		setting		sibility		modes			

Sub-index 01h	Name	OUT1 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	4	Accessibility	RW	Related modes	-	Mapped	YES

Set the OUT function corresponding to the hardware OUT1 terminal. Please refer to the table below for parameter value setting.。

Set value	OUT OUT terminal function	Set value	OUT OUT terminal function
0	FunOUT.0：Brake	7	FunOUT.7：USER1
1	FunOUT.1：Alarm	8	FunOUT.8：USER2
2	FunOUT.2：Position reached	9	FunOUT.9：USER3
3	FunOUT.3：Speed reached	10	FunOUT.10：USER4
4	FunOUT.4：Servo ready	11	FunOUT.11：USER5
5	FunOUT.5：Internal position command shutdown	12	FunOUT.12：USER6
6	FunOUT.6：Back to origin completed	13	FunOUT.13: Moment reaches

Sub-index 02h	Name	OUT1 terminal logic selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Set the output level logic of the hardware OUT1 terminal when the OUT function selected by OUT1 is valid

Set value	OUT1 terminal logic when OUT function is valid	Transistor state
0	Low pegel	Conduction
1	High pegel	Turn off

Sub-index 03h	Name	OUT2 terminal function selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	1	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 04h	Name	OUT2 TERMINAL LOGIC SELECTION					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 05h	Name	OUT3 TERMINAL FUNCTION SELECTION				Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	2	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 06h	Name	OUT3 terminal logic selection				Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 07h	Name	OUT4 terminal function selection				Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-index 08h	Name	OUT4 terminal logic selection				Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

6.3.7 Position control parameters

Index2006h	Name	Position control parameters				Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Accessibility	-	Related modes	-	Mapped	YES

Sub-index 00h	Name	Maximum Sub-index number				Data structure	-	Data type	Uint8
	Data range	-	Factory setting	8	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Position command reset setting				Data structure	-	Data type	Uint16
	Data range	0 ~ 31	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES
Set the clear operation mode of the position command counter when the motor is not enabled: 0: Position command is cleared 1: Position command is not cleared										

Sub-index 02h	Name	Reserve	Data structure	-	Data type	Uint16

	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 03h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 04h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 05h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 06h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 07h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 08h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	NO

6.3.8 Speed control parameters

Index 2007h	Name	Speed control parameters					Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Acces sibility	-	Related modes	-	Mapped	YES

Sub-index 00h	Name	Maximum Sub-index number	Data structure	-	Data type	Uint8

	Data range	-	Factory setting	3	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Jog speed (unit: rpm)					Data structure	-	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	100	Acces sibility	RW	Related modes	-	Mapped	YES

Sub-index 02h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	0	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 03h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	10	Acces sibility	RO	Related modes	-	Mapped	NO

6.3.9 Torque control parameters

Index 2008h	Name	Torque control parameters					Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Acces sibility	-	Related modes	-	Mapped	YES

Sub-index 00h	Name	Maximum Sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	13	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-index 01h	Name	Torque command filter time constant (unit: 0.01ms)					Data structure	-	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	1000	Acces sibility	RW	Related modes	-	Mapped	YES

Sub-index 02h	Name	The second torque command filter time constant (unit: 0.01ms)					Data structure	-	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	1000	Acces sibility	RW	Related modes	-	Mapped	YES

Sub-index 03h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 04h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	3000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 05h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	3000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 06h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	10	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 07h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 08h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	3000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 09h	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	3000	Accessibility	RO	Related modes	-	Mapped	NO

Sub-index 0Ah	Name	Torque reaches the reference value (unit: 0.1%)					Data structure	-	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	0	Accessibility	RO	Related modes	PT/CST	Mapped	NO

Sub-index 0Bh	Name	Torque reaches the effective value (unit: 0.1%)					Data structure	-	Data type	Uint16

	Data range	0 ~ 3000	Factory setting	0	Acces sibility	RW	Related modes	PT/ CST	Mapped	NO

Sub-index 0Ch	Name	Torque reaches invalid value (unit: 0.1%)					Data structure	-	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	0	Acces sibility	RW	Related modes	PT/ CST	Mapped	NO

Sub-index 0Dh	Name	Reserve					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	50	Acces sibility	RW	Related modes	-	Mapped	NO

6.3.10 Gain parameters

Index 2009h	Name	Gain parameters					Data structure	ARR	Data type	Uint16
	Data range	OD Data range	Factory setting	OD DEFAULT VALUE	Acces sibility	-	Related modes	-	Mapped	YES

Sub-index 00h	Name	Maximum Sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	22	Acces sibility	RO	Related modes	-	Mapped	NO

Sub-Index 01h	Name	The first speed proportional gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	4000	Acces sibility	RW	Related modes	-	Mapped	YES

Sub-Index 02h	Name	The first speed integral time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1500	Acces sibility	RW	Related modes	-	Mapped	YES

Sub-Index 03h	Name	The first position proportional gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	800	Acces sibility	RW	Related modes	-	Mapped	YES

Sub-Index 04h	Name	The second speed proportional gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	4000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 05h	Name	The second speed integral time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1500	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 06h	Name	The second position proportional gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	800	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 07h	Name	Speed Kd					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 08h	Name	Speed Kr					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 09h	Name	Speed Km					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Ah	Name	Load inertia ratio (unit: %)					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	100	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Bh	Name	Speed feedforward filter time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	2000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Ch	Name	Speed feedforward gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Dh	Name	Torque feedforward filter time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	2000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Eh	Name	Torque feedforward gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Fh	Name	Speed feedback filter time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 10h	Name	Speed feedback low-pass filter cut-off frequency 1					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 11h	Name	Speed feedback low-pass filter cut-off frequency 2					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	2000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 12h	Name	Reserved					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 13h	Name	Torque reference filter time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	3000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 14h	Name	Torque feedback filter time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	3000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 15h	Name	Current loop proportional gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	800	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 16h	Name	Current loop integral time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	50	Accessibility	RW	Related modes	-	Mapped	YES

6.3.11 Self-tuning parameters

Index 200Ah	Name	Self-tuning parameters					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	-	Mapped	YES

Sub-Index 00h	Name	Maximum sub-index number					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	10	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 01h	Name	Adaptive notch filter mode selection					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	5000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 02h	Name	Group 1 trap frequency					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1024	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 03h	Name	Group 1 trap width level					Data structure	-	Data type	Uint16
	Data	0 ~ 65535	Factory	128	Accessi	RW	Related	-	Mapped	YES

	range		setting		bility		modes			

Sub-Index 04h	Name	Group 1 trap depth level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	5000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 05h	Name	Group 2 trap frequency					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1024	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 06h	Name	Group 2 trap width level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	128	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 07h	Name	Group 2 trap depth level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	5000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 08h	Name	Group 3 trap frequency					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1024	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 09h	Name	Group 3 trap width level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	128	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Ah	Name	Group 3 trap depth level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	5000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Bh	Name	Group 4 trap frequency					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1024	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Ch	Name	Group 4 trap width level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	128	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Dh	Name	Group 4 trap depth level					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	5000	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Eh	Name	Resonance frequency identification result					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1024	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 0Fh	Name	Torque disturbance compensation gain					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	128	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 10h	Name	Torque disturbance observer filter time constant					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	128	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 11h	Name	Low frequency resonance frequency					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	100	Accessibility	RW	Related modes	-	Mapped	YES

Sub-Index 12h	Name	Low frequency resonance frequency filter setting					Data structure	-	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	1000	Accessibility	RW	Related modes	-	Mapped	YES

6.3.12 Fault parameters

Index 200Bh	Name	Fault parameters				Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	-	Mapped	YES

Sub-Index 00h	Name	Maximum sub-index number				Data structure	-	Data type	Uint8
	Data range	-	Factory setting	11	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 01h	Name	Historical fault record 0				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 02h	Name	Historical fault record 1				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 03h	Name	Historical fault record 2				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 04h	Name	Historical fault record 3				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 05h	Name	Historical fault record 4				Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 06h	Name	Historical fault record 5				Data structure	-	Data type	Uint16
	Data	-	Factory	-	Acces	RO	Related	-	Mapped	NO

	range		setting		sibility		modes			

Sub-Index 07h	Name	Historical fault record 6					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 08h	Name	Historical fault record 7					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 09h	Name	Historical fault record 8					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 0Ah	Name	Historical fault record 9					Data structure	-	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 0Ah	Name	Clear historical fault records					Data structure	-	Data type	Uint16
	Data range	0 ~ 1	Factory setting	0	Accessibility	RW	Related modes	-	Mapped	NO

6.4 Detailed description of sub-protocol definition parameters (6000h group)

Index 603Fh	Name	Error code					Data structure	VAR	Data type	Uint16
	Data range	0 ~ 65535	Factory setting	-	Accessibility	RO	Related modes	ALL	Mapped	TPDO
When the driver has an error described in the DS402 sub-protocol, 603Fh is consistent with the DS402 protocol. The value of 603Fh is hexadecimal data.										

Index 6040h	Name	Control word					Data structure	VAR	Data type	Uint16
	Data range	0～65535	Factory setting	0	Acces sibility	RW	Related modes	ALL	Mapped	RPDO

Set control commands：

Bit	Name		Description
0	可以开启伺服运行	Switch on	0：Invalid，1：Valid
1	接通主回路电	Enable voltage	0：Invalid，1：Valid
2	快速停机	Quick stop	0：Invalid，1：Valid
3	伺服运行	Enable operation	0：Invalid，1：Valid
4~6	运行模式相关	Operation mode specific	Related to servo operation mode
7	故障复位	Fault reset	For resettable faults and warnings, perform the fault reset function. The positive edge of Bit7 is valid; Bit7 remains at 1, and other control commands are invalid.
8	暂停	Halt	For the pause mode in each mode, please query the object dictionary 605Dh
9	运行模式相关	Operation mode specific	Related to each servo operation mode
10	保留	Reverse	Undefined
11~15	厂家自定义	Manufacturer-specific	Manufacturer-specific

Note:

1) It is meaningless to assign each Bit bit of the control word individually, and it must form a control command with others that do not work together;

2) Bit0～Bit3 and Bit7 have the same meaning in each servo mode. Commands must be sent in order to guide the servo drive into the expected state according to the CiA402 state machine switching process. Each command corresponds to a certain state;

3) Bit4～Bit6 are related to each servo mode, please check the control commands in different modes;

4). Bit9 has no defined function.

Index 6041h	Name	Status word					Data structure	VAR	Data type	Uint16
	Data range	0～65535	Factory setting	0	Acces sibility	RO	Related modes	ALL	Mapped	TPDO

Reflect the current running status of the servo drive:

Bit	Name		Description
0	伺服准备好	Ready to switch on	0：Invalid，1：Valid

1	可以开启伺服运行	Switch on	0：Invalid，1：Valid
2	伺服运行	Operation enabled	0：Invalid，1：Valid
3	故障	Fault	0：Invalid，1：Valid
4	主电路电接通	Voltage enabled	0：Invalid，1：Valid
5	快速停机	Quick stop	0：Invalid，1：Valid
6	伺服不可运行	Switch on disabled	0：Invalid，1：Valid
7	警告	Waming	0：Invalid，1：Valid
8	厂家自定义	Manufacturer specific	Undefined function
9	远程控制	Remote	0：Invalid，1：Valid（控制字生效）
10	目标到达	Target reach	0：Invalid，1：Valid
11	内部限制有效	Internal limit active	0：Invalid，1：Valid
12~13	运行模式相关	Operation limit active	Related to each servo operation mode
14	厂家自定义	Manufacturer specific	Undefined function
15	原点已找到	Home find	0：Invalid，1：Valid

Display value (binary value)	Description
xxxx xxxx x0xx 0000	未准备好（Not ready to switch on）
xxxx xxxx x1xx 0000	启动失效（Switch on disabled）
xxxx xxxx x01x 0001	准备好（Ready to switch on）
xxxx xxxx x01x 0011	启动（Switch on）
xxxx xxxx x01x 0111	操作使能（Operation enabled）
xxxx xxxx x00x 0111	快速停机有效（Quick stop active）
xxxx xxxx x0xx 1111	故障反应有效（Fault reaction active）
xxxx xxxx x0xx 1000	故障（Fault）

Note:

Bit0 ~ Bit9 have the same meaning in each servo mode. After the control word 6040h sends commands in order, the servo will feedback a certain state.

Bit12~Bit13 are related to each servo mode (please check the control commands in different modes)

3) Bit10, Bit11, and Bit15 have the same meaning in each servo mode, and feedback the status of the servo after executing a certain servo mode

Index 605Ah	Name	Quick stop mode selection					Data structure	VAR	Data type	Int16
	Data range	0 ~ 6	Factory setting	2	Acces sibility	RW	Related modes	ALL	Mapped	NO

Index 605Bh	Name	Shutdown method selection					Data structure	VAR	Data type	Int16
	Data range	0～6	Factory setting	2	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 605Ch	Name	Enable failure mode selection					Data structure	VAR	Data type	Int16
	Data range	0～6	Factory setting	2	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 605Eh	Name	Failure mode selection					Data structure	VAR	Data type	Int16
	Data range	0～6	Factory setting	2	Accessibility	RW	Related modes	ALL	Mapped	NO

Index 6060h	Name	Mode selection					Data structure	VAR	Data type	Int16
	Data range	0～10	Factory setting	8	Accessibility	RW	Related modes	ALL	Mapped	RPDO

Selection of servo operation mode

Setting value	Servo mode	
0/2/5	NA	Reserved
1	轮廓位置模式（PP）	
3	轮廓速度模式（PV）	
4	轮廓转矩模式（PT）	
6	回零模式（HM）	
7	插补模式（IP）	
8	周期同步位置模式（CSP）	
9	周期同步速度模式（CSV）	
10	周期同步转矩模式（CST）	

Index 6061h	Name	Operating mode display					Data structure	VAR	Data type	Int16
	Data range	0～10	Factory setting	0	Accessibility	RO	Related modes	ALL	Mapped	TPDO

Display the current operating mode of the servo driver:

Setting value	Servo mode	
0/2/5	NA	Reserved
1	轮廓位置模式（PP）	
3	轮廓速度模式（PV）	

	4	轮廓转矩模式（PT）	
	6	回零模式（HM）	
	7	插补模式（IP）	
	8	周期同步位置模式（CSP）	
	9	周期同步速度模式（CSV）	
	10	周期同步转矩模式（CST）	

Index 6062h	Name	Position command (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RW	Related modes	PP/HM/CSP	Mapped	TPDO
Reflect the input position command (command unit) when the servo is enabled										

Index 6063h	Name	Position feedback (unit: encoder unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	ALL	Mapped	TPDO
Reflect the absolute position of the motor, encoder unit										

Index 6064h	Name	Position feedback (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	0	Accessibility	RO	Related modes	ALL	Mapped	TPDO
Reflect real-time user absolute position feedback: position feedback 6064h x gear ratio 6091h = position feedback 6063h										

Index 6065h	Name	Threshold for excessive position deviation (unit: command unit)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (232-1)	Factory setting	17bit: 393216 23bit: 25165824	Accessibility	RW	Related modes	PP/HM/CSP	Mapped	RPDO
Set the threshold for excessive position deviation. When the absolute value of the position deviation (command unit) exceeds 6065h, AL.240 (excessive position deviation fault) will occur. Note: When the set value of 6065h is 0xFFFFFFFF, the servo will not monitor the excessive position deviation. Please use this function with caution. Note: The parameter needs to be saved by writing 1 to P12.20 through the USB serial port or the host computer debugging software when the motor is not enabled.										

Index 6067h	Name	The position reaches the threshold					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (232-1)	Factory setting	92	Acces sibility	RW	Related modes	PP/HM/ CSP	Mapped	RPDO
Set the threshold for reaching the position. The unit of 6067h can be set by 2006-07h, and the default is the command unit. When the absolute value of the position deviation is within 6067h and the time reaches 6068h, the position arrival is considered valid. In PP/HM/CSP mode, Bit10 of the status word 6041=1. In PP/HM/CSP mode, when the servo is enabled, this flag is meaningful, otherwise it is meaningless										

Index 6068h	Name	Position reached time window (unit: ms)					Data structure	VAR	Data type	Uint16
	Data range	0 ~ (216-1)	Factory setting	10	Acces sibility	RW	Related modes	PP/HM/ CSP	Mapped	RPDO
Set the time window for judging the arrival of the position The absolute value of the difference between the user position command 6062h and the user actual position feedback 6064h or the internal position command 60FCh and the position feedback 6063h is within 6067h, and the time reaches 6068h, the position is considered to be reached, the status word 6041h Bit10=1, when the enable is invalid, this flag bit is meaningless.										

Index 606Ch	Name	Speed feedback (unit: command unit/s)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	ALL	Mapped	TPDO

Index 606Dh	Name	Speed reaches the threshold					Data structure	VAR	Data type	Uint16
	Data range	0 ~ (216-1)	Factory setting	10	Acces sibility	RW	Related modes	PV/CSV	Mapped	RPDO
Set the threshold for speed reached The absolute value of the difference between the target speed 60FFh (when converted into motor speed rpm unit) and the actual speed of the motor is within 606Dh, and when the time reaches 606Eh, the speed is considered to be reached, and Bit10 of the status word 6041=1, and the speed reaches the OUT function signal at the same time, the output is valid.										

Index 606Dh	Name	Speed reaches the threshold					Data structure	VAR	Data type	Uint16
	Data	0 ~ (216-1)	Factory	10	Acces	RW	Related	PV/C	Mapped	RPDO

	range		setting		sibility		modes	SV		
Set the threshold for speed reached The absolute value of the difference between the target speed 60FFh (when converted into motor speed rpm unit) and the actual speed of the motor is within 606Dh, and when the time reaches 606Eh, the speed is considered to be reached, and Bit10 of the status word 6041=1, and the speed reaches the OUT function signal at the same time, the output is valid.										

Index 606Eh	Name	Speed arrival time window (unit: ms)				Data structure	VAR	Data type	Uint16
	Data range	0 ~ (216-1)	Factory setting	10	Acces sibility	RW	Related modes	PV/CSV	Mapped	RPDO

Index 6071h	Name	Target torque (unit: 0.1%)				Data structure	VAR	Data type	Int16
	Data range	-3000 ~ 3000	Factory setting	0	Acces sibility	RW	Related modes	PT/CST	Mapped	RPDO
Set the servo target torque in profile torque mode (PT) and Cyclic synchronous torque mode (CST). 100.0% corresponds to 1 times the rated torque of the motor.										

Index 6072h	Name	Maximum torque (unit: 0.1%)				Data structure	VAR	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	3000	Acces sibility	RW	Related modes	ALL	Mapped	RPDO
Set the maximum torque allowable value of the servo. 100.0% corresponds to 1 times the rated torque of the motor.										

Index 6074h	Name	Target torque (unit: 0.1%)				Data structure	VAR	Data type	Int16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	ALL	Mapped	TPDO
Display the current value of the servo internal torque command in the servo running state. 100.0% corresponds to 1 times the rated torque of the motor.										

Index 6077h	Name	Torque feedback (unit: 0.1%)				Data structure	VAR	Data type	Int16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	ALL	Mapped	TPDO
Display the internal torque feedback of the servo. 100.0% corresponds to 1 times the rated torque of the motor.										

Index 607Ah	Name	Target position (unit: command unit)	Data structure	VAR	Data type	Int32

	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	PP/CSP	Mapped	RPDO
Set the servo target position in profile position mode (PP) and cyclic synchronous position mode (CSP)										

Index 607Ch	Name	Origin offset					Data structure	VAR	Data type	Int32
	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	HM	Mapped	RPDO
Set the physical position where the mechanical zero point deviates from the motor origin under homing. Origin offset valid condition: this time power-on operation, the origin return operation has been completed, Bit15 of status word 6041h = 1 The role of origin offset: According to 60E6h, determine the user's current position after the homing is completed.										

Index 607Dh	Name	Software absolute position limit					Data structure	ARR	Data type	Uint16
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	-	Mapped	YES

Sub-Index 00h	Name	Maximum sub-index number restricted by software absolute position					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	2	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 01h	Name	Minimum software absolute position limit (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	ALL	Mapped	RPDO
Set the minimum software absolute position limit, which refers to the absolute position relative to the mechanical zero point.										

Sub-Index 02h	Name	Maximum software absolute position limit (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	ALL	Mapped	RPDO
Set the maximum software absolute position limit, which refers to the position relative to the mechanical zero point.										

Index 607Fh	Name	Maximum profile velocity (unit: command unit/s)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	10000	Acces sibility	RW	Related modes	ALL	Mapped	RPDO

Index 6081h	Name	Profile velocity (unit: command unit/s)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	10000	Acces sibility	RW	Related modes	PP	Mapped	RPDO
Set the uniform running speed of the displacement command in the profile position mode.										

Index 6083h	Name	Profile acceleration (unit: command unit/s2)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	100000	Acces sibility	RW	Related modes	PP/PV	Mapped	RPDO
Set the acceleration in profile position mode and profile velocity mode.										

Index 6084h	Name	Profile deceleration (unit: command unit/s2)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	100000	Acces sibility	RW	Related modes	PP/PV/ CSP/CSV	Mapped	RPDO
Set the deceleration in profile position mode and profile speed mode.										

Index 6085h	Name	Quick stop deceleration (unit: command unit/s2)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	100000	Acces sibility	RW	Related modes	PP/PV/ CSP/CSV/HM	Mapped	RPDO

Index 6087h	Name	Torque ramp (unit: 0.1%/s)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	100000	Acces sibility	RW	Related modes	PT/CST	Mapped	RPDO
Set the torque command acceleration in profile torque mode, and its meaning is: torque command increment per second.										

Index 6091h	Name	Gear ratio					Data structure	ARR	Data type	Uint32
	Data range	OD data range	Factory setting	OD default	Acces sibility	-	Related modes	PP/PV/ CSP/C	Mapped	YES

				value				SV/HM		

The gear ratio is used to establish the proportional relationship between the displacement of the load shaft specified by the user and the displacement of the motor shaft.

1）、The relationship between motor feedback position (encoder unit) and load shaft position feedback (command unit):

$$\text{Motor feedback position} = \text{Load shaft position feedback} \times \text{Gear ratio}$$

2）、The relationship between motor speed (rpm) and load shaft speed (command unit/s):

$$\text{Motor speed(rpm)} = \frac{\text{Load shaft speed} \times \text{Gear ratio}}{\text{Encoder resolution}} \times 60$$

3）、The relationship between motor acceleration (rpm/ms) and load speed (command unit/s2):

$$\text{Motor acceleration} = \frac{\text{Load shaft acceleration} \times \text{Gear ratio}}{\text{Encoder resolution}} \times \frac{1000}{60}$$

Sub-Index 00h	Name	Maximum sub-index number of gear ratio				Data structure	-	Data type	Uint8
	Data range	-	Factory setting	2	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 01h	Name	Gear ratio numerator				Data structure	VAR	Data type	Int32
	Data range	1 ~ (231-1)	Factory setting	1	Accessibility	RW	Related modes	-	Mapped	RPDO

Sub-Index 02h	Name	Gear ratio denominator				Data structure	VAR	Data type	Int32
	Data range	1 ~ (231-1)	Factory setting	1	Accessibility	RW	Related modes	-	Mapped	RPDO

Index 6098h	Name	Homing				Data structure	VAR	Data type	Int8
	Data range	0 ~ 35	Factory setting	0	Accessibility	RW	Related modes	HM	Mapped	RPDO
Please check the "Homing Mode (HM)" chapter										

Index 6099h	Name	Homing speed				Data structure	ARR	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	HM	Mapped	YES

Sub-Index 00h	Name	Maximum sub-index number of homing speed				Data structure	-	Data type	Uint8
	Data	-	Factory	2	Acces	RO	Related	-	Mapped	NO

	range		setting		sibility		modes			

Sub-Index 01h	Name	Homing high speed (unit: command unit/s)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	10000	Accessibility	RW	Related modes	HM	Mapped	RPDO

Sub-Index 02h	Name	Homing low speed (unit: command unit/s)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	2000	Accessibility	RW	Related modes	HM	Mapped	RPDO

Index 609Ah	Name	Homing acceleration (unit: command unit/s2)					Data structure	VAR	Data type	Uint32
	Data range	0 ~ (231-1)	Factory setting	100000	Accessibility	RW	Related modes	HM	Mapped	RPDO

Index 60B0h	Name	Position offset (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	CSP	Mapped	RPDO
Set the servo position command offset in the periodic synchronous position mode. After the offset: Servo target position = 607Ah + 60B0h										

Index 60B1h	Name	Speed offset (Unit: Command Unit)					Data structure	VAR	Data type	Int32
	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	CSP/ CSV	Mapped	RPDO
Set the servo speed command offset in the periodic synchronous speed mode. After the offset: Servo target speed= 60FFh + 60B1h										

Index 60B2h	Name	Torque offset (unit: 0.1%)					Data structure	VAR	Data type	Int16
	Data range	-3000 ~ 3000	Factory setting	0	Accessibility	RW	Related modes	CSP/ CSV/ CST	Mapped	RPDO
Set the servo torque command offset in the periodic synchronous torque mode. After the offset: Servo target torque = 6071h + 60B2h										

Index 60B8h	Name	Probe function	Data structure	VAR	Data type	Uint16

	Data range	0 ~ (216-1)	Factory setting	0	Acces sibility	RW	Related modes	-	Mapped	RPDO

Set the functions of probe 1 and probe 2

Bit 位	Description	Setting
0	Probe 1 enable	0：Probe 1 is not enabled 1：Probe 1 enable
1	Probe 1 trigger mode	0：Single trigger, trigger only when the trigger signal is valid for the first time 1：Continuous trigger
2	Probe 1 trigger signal selection	0：IN input signal 1：Meaningless
3	NA	Meaningless
4	Probe 1 positive edge enable	0：The positive edge is not latched 1：Positive edge latched
5	Probe 1 negative edge enable	0：The negative edge is not latched 1：Negative edge latched
6	NA	Meaningless
7	NA	Meaningless
8	Probe 2 enable	0：Probe 2 is not enabled 1：Probe 2 enable
9	Probe 2 trigger mode	0：Single trigger, trigger only when the trigger signal is valid for the first time 1：Continuous trigger
10	Probe 2 trigger signal selection	0：IN input signal 1：Meaningless
11	NA	Meaningless
12	Probe 2 positive edge enable	0：The positive edge is not latched 1：Positive edge latched
13	Probe 1 negative edge enable	0：The negative edge is not latched 1：Negative edge latched
14	NA	Meaningless
15	NA	Meaningless

Index 60B9h	Name	Probe status					Data structure	VAR	Data type	Uint16
	Data range	-	Factory setting	-	Acces sibility	RO	Related modes	-	Mapped	TPDO

Read the status of probe 1 and probe 2

Bit	Description	Remarks
0	Probe 1 enable	0：Probe 1 is not enabled 1：Probe 1 enable
1	The positive edge of probe 1 is latched and executed	0：The positive edge latch is not executed 1：The positive edge latch has been executed
2	The negative edge of probe 1 is latched and executed	0：The negative edge latch is not executed 1：The negative edge latch has been executed
3 ~ 6	NA	Meaningless
7	Probe 1 trigger signal monitoring	0：IN is low level 1：IN is high level
8	Probe 2 enable	0：Probe 2 is not enabled 1：Probe 2 enable
9	The positive edge of probe 2 is latched and executed	0：The positive edge latch is not executed 1：The positive edge latch has been executed
10	The negative edge of probe 2 is latched and executed	0：The negative edge latch is not executed 1：The negative edge latch has been executed
11 ~ 14	NA	Meaningless
15		Meaningless

Index 60BAh	Name	Probe 1 positive edge position feedback (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60BBh	Name	Probe 1 negative edge position feedback (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60BCh	Name	Probe 2 positive edge position feedback (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60BDh	Name	Probe 12 negative edge position feedback (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60D5h	Name	Probe 1 positive edge count					Data structure	VAR	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60D6h	Name	Probe 1 negative edge count					Data structure	VAR	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60D7h	Name	Probe 1 positive edge count					Data structure	VAR	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60D8h	Name	Probe 1 negative edge count					Data structure	VAR	Data type	Uint16
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Index 60E0h	Name	Maximum forward torque limit (unit: 0.1%)					Data structure	VAR	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	0	Accessibility	RW	Related modes	ALL	Mapped	RPDO

Index 60E1h	Name	Maximum negative torque limit (unit: 0.1%)					Data structure	VAR	Data type	Uint16
	Data range	0 ~ 3000	Factory setting	0	Accessibility	RW	Related modes	ALL	Mapped	RPDO

Index 60F4h	Name	Position deviation (unit: command unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	PP/HM/CSP	Mapped	TPDO

Index 60FCh	Name	Position command (unit: encoder unit)					Data structure	VAR	Data type	Int32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	PP/HM/CSP	Mapped	TPDO

Index 60FDh	Name	Digital input					Data structure	VAR	Data type	Uint32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	TPDO

Reflect the current IN terminal logic of the driver:

0-logic invalid, 1-logic valid

Bit	Description
0	Forward limit switch
1	Reverse limit switch
2	Origin switch
3 ~ 15	NA
16	IN1
17	IN2
18	IN3
19	IN4
20	IN5
21	IN6
22	IN7
23	IN8
24 ~ 31	NA

Index 60FEh	Name	Digital output					Data structure	ARR	Data type	Uint32
	Data range	OD data range	Factory setting	OD default value	Accessibility	-	Related modes	-	Mapped	YES

Sub-Index 00h	Name	Maximum sub-index number of digital output					Data structure	-	Data type	Uint8
	Data range	-	Factory setting	2	Accessibility	RO	Related modes	-	Mapped	NO

Sub-Index 01h	Name	Physical output					Data structure	VAR	Data type	Uint32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	RPDO

Reflect the output logic of the OUT port of the driver

Bit	Related OUT port	Description
0 ~ 15	NA	
16	OUT1	Forced output (0: OFF, 1: ON), only valid when Bit 16 of 60FE-02h is set to 1
17	OUT2	Forced output (0: OFF, 1: ON), only valid when Bit 17 of 60FE-02h is set to 1
18	OUT3	Forced output (0: OFF, 1: ON), only valid when Bit 18 of 60FE-02h is set to 1
19	OUT4	Forced output (0: OFF, 1: ON), only valid when Bit 19 of 60FE-02h is set to 1
20 ~ 31	NA	

Note:

The function setting value of the OUT port must be set to 31 (general output) to be controlled by 60FE-1h and 60FE-2h

Sub-Index 02h	Name	Physical output enable					Data structure	VAR	Data type	Uint32
	Data range	-	Factory setting	-	Accessibility	RO	Related modes	-	Mapped	RPDO

Set whether to enable OUT forced output:

Bit	Related OUT port	Description
0 ~ 15	NA	
16	OUT1	0：Disable forced output of OUT1 1：Enable forced output of OUT1
17	OUT2	0：Disable forced output of OUT2 1：Enable forced output of OUT2
18	OUT3	0：Disable forced output of OUT3 1：Enable forced output of OUT3
19	OUT4	0：Disable forced output of OUT4 1：Enable forced output of OUT4
20 ~ 31	NA	

Index 60FFh	Name	Target velocity (unit: command unit/s)					Data structure	VAR	Data type	Int32
	Data range	-231 ~ (231-1)	Factory setting	0	Accessibility	RW	Related modes	PV/CSV	Mapped	RPDO

Set the user speed command in profile speed velocity and cyclic synchronous velocity mode

Index 60FFh	Name	Support servo operation mode				Data structure	VAR	Data type	Uint32
	Data range	-	Factory setting	941	Accessibility	RO	Related modes	-	Mapped	NO

Reflect the servo operation mode supported by the driver

Bit	Description	Support (0: not supported, 1: supported)
0	轮廓位置模式（PP）	1
1	变频调速模式（VL）	0
2	轮廓速度模式（PV）	1
3	轮廓转矩模式（PT）	1
4	NA	0
5	回零模式（HM）	1
6	插补模式（IP）	0
7	周期同步位置模式(CSP)	1
8	周期同步速度模式(CSV)	1
9	周期同步转矩模式(CST)	1
10～31	NA	0

7. Appendix

Appendix A List of relationship between driver LED display parameters and object dictionary

Group P00:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P00.00	0x2000-01	Motor ID	0～65535	-	40604
P00.01	-	Driver ID	-	-	display
P00.02	0x2001:01	MCU software version	-	-	display
P00.03	0x2001:02	FPGA software version	-	-	display
P00.04	0x2001:03	EtherCAT software version	-	-	display
P00.05	-	Driver hardware version	-	-	display
P00.06	-	CAN software version	-	-	display
P00.07	-	Non-standard ID	-	-	display
P00.08	-	Hardware ID	-	-	display
P00.17	0x2000:02	Motor rated power	1～65535	0.01KW	40

P00.18	0x2000:03	Motor rated voltage	1 ~ 380	V	220
P00.19	0x2000:04	Motor rated current	1 ~ 65535	0.1A	28
P00.20	0x2000:05	Motor rated speed	100 ~ 6000	RPM	3000
P00.21	0x2000:06	Motor max speed	100 ~ 6000	RPM	5000
P00.22	0x2000:07	Motor rated torque	1 ~ 65535	0.01Nm	127
P00.23	0x2000:08	Motor max torque	1 ~ 65535	0.01Nm	382
P00.24	0x2000:09	Moment of inertia	1 ~ 65535	0.01kgcm	63
P00.25	0x2000:0A	Number of motor pole pairs	2 ~ 360	pole pairs	5
P00.26	0x2000:0B	Motor stator resistance	1 ~ 65535	0.001Ω	7100
P00.27	0x2000:0C	Motor stator inductance Lq	1 ~ 65535	0.01mH	1450
P00.28	0x2000:0D	Motor stator inductance Ld	1 ~ 65535	0.01mH	1450
P00.29	-	Motor line back-EMF coefficient	1 ~ 65535	0.01mv/rpm	3530
P00.30	0x2000:0E	Motor torque coefficient Kt	1 ~ 65535	0.01Nm/Arms	55
P00.31	-	Motor electrical constant Te	1 ~ 65535	0.01ms	360
P00.32	-	Motor mechanical constant Tm	1 ~ 65535	0.01ms	360
P00.34	0x2002:01	Encoder type	0 ~ 4	-	2
P00.35/P00.36	0x2002:02	Absolute encoder position offset	0 ~ 1073741824	P	0
P00.37	0x2002:03	Absolute encoder resolution	0 ~ 65535	Bit	17
P00.38	-	Incremental encoder resolution	-	P/r	-
P00.39	-	Z-phase signal offset pulse number of incremental encoder	-	P	-
P00.40	-	U-phase positive edge offset pulse number of incremental encoder	-	P	-
P00.41	0x2002:04	Prohibit multiturn absolute encoder battery fault alarm function	0 ~ 1	-	0
P00.42	0x2002:05	Multiturn absolute encoder multiturn resolution	0 ~ 24	Bit	16
P00.43	0x2002:06	Percentage of power-on lock shaft current	0 ~ 100	%	90
P00.44	0x2002:07	Set the current position as the origin	0 ~ 1	-	0
P00.45/P00.46	0x2002:08	Set the encoder single-turn value of the mechanical zero position	0 ~ 16777216	P	0
P00.47/P00.48	0x2002:09	Set the encoder multiturn value of the mechanical zero position	-16777216 ~ 16777216	Circle	0
P00.49	0x2002:0A	Forbidden to update the position command according to the encoder position	0 ~ 1	-	0

Group P01:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P01.00	0x2003:01	Control mode selection	0 ~ 3	-	3
P01.01	0x2003:02	Rotation direction selection	0 ~ 1	-	0
P01.02	-	Servo forced enable	-	-	-
P01.20	0x2003:03	The minimum value of braking resistance allowed by the driver	-	Ω	30
P01.21	0x2003:04	Built-in braking resistor power	-	W	40
P01.22	0x2003:05	Built-in braking resistor resistance	-	Ω	200
P01.23	0x2003:06	Resistance heat dissipation coefficient	1 ~ 100	%	20
P01.24	0x2003:07	Braking resistor selection setting	0 ~ 1	-	0
P01.25	0x2003:08	External braking resistor power	1 ~ 65535	W	100
P01.26	0x2003:09	Resistance of external braking resistor	1 ~ 1000	Ω	50
P01.27	0x2003:0A	Energy consumption braking opening voltage	50 ~ 400	V	370
P01.28	0x2003:0B	Energy consumption braking feedback detection function prohibited	0 ~ 1	-	0
P01.29	0x2003:0C	Maximum duration of energy consumption braking	1 ~ 65535	ms	3000
P01.33	0x2003:0D	Emergency stop deceleration time constant	-	ms	-
P01.34	-	User password	0 ~ 65535	-	512
P01.35	-	Panel initial display function setting	0 ~ 99	-	1
P01.36	0x2003:0F	Servo enable delay off	0 ~ 65535	ms	50
P01.37	-	Speed loop saturation output detection time	0 ~ 65535	10ms	200
P01.39	-	Encoder disconnection detection function prohibited	-	-	-
P01.42	-	Command overload start detection point	1 ~ 300	%	100
P01.43	-	Command overload peak detection point	1 ~ 300	%	300
P01.44	-	Command overload detection time	1 ~ 65535	10ms	200
P01.45	-	Thermal overload initial detection point	1 ~ 300	%	100
P01.46	-	Thermal overload peak detection point	1 ~ 300	%	300
P01.47	-	Thermal overload detection time	1 ~ 65535	10ms	200
P01.48	-	Overvoltage alarm voltage threshold	220 ~ 399	V	380
P01.49	-	Undervoltage alarm voltage threshold	85 ~ 399	V	141

Group P02:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P02.00	0x2004:01	IN1 terminal function selection	0 ~ 31	-	0
P02.01	0x2004:02	IN1 terminal logic selection	0 ~ 1	-	0
P02.02	0x2004:03	IN2 terminal function selection	0 ~ 31	-	30
P02.03	0x2004:04	IN2 terminal logic selection	0 ~ 1	-	0
P02.04	0x2004:05	IN3 terminal function selection	0 ~ 31	-	31
P02.05	0x2004:06	IN3 terminal logic selection	0 ~ 1	-	0
P02.06	0x2004:07	IN4 terminal function selection	0 ~ 31	-	5
P02.07	0x2004:08	IN4 terminal logic selection	0 ~ 1	-	0
P02.08	0x2004:09	IN5 terminal function selection	0 ~ 31	-	6
P02.09	0x2004:0A	IN5 terminal logic selection	0 ~ 1	-	0
P02.10	0x2004:0B	IN6 terminal function selection	0 ~ 31	-	23
P02.11	0x2004:0C	IN6 terminal logic selection	0 ~ 1	-	0
P02.12	0x2004:0D	IN7 terminal function selection	0 ~ 31	-	0
P02.13	0x2004:0E	IN7 terminal logic selection	0 ~ 1	-	0
P02.14	0x2004:0F	IN8 terminal function selection	0 ~ 31	-	11
P02.15	0x2004:10	IN8 terminal logic selection	0 ~ 1	-	0
P02.16	-	IN9 terminal function selection	-	-	-
P02.17	-	IN9 terminal logic selection	-	-	-
P02.32	0x2005:01	OUT1 terminal function selection	0 ~ 31	-	4
P02.33	0x2005:02	OUT1 terminal logic selection	0 ~ 1	-	0
P02.34	0x2005:03	OUT2 terminal function selection	0 ~ 31	-	1
P02.35	0x2005:04	OUT2 terminal logic selection	0 ~ 1	-	0
P02.36	0x2005:05	OUT3 terminal function selection	0 ~ 31	-	2
P02.37	0x2005:06	OUT3 terminal logic selection	0 ~ 1	-	0
P02.38	0x2005:07	OUT4 terminal function selection	0 ~ 31	-	0
P02.39	0x2005:08	OUT4 terminal logic selection	0 ~ 1	-	0
P02.40	-	OUT5 terminal function selection	-	-	-
P02.41	-	OUT5 terminal logic selection	-	-	-
P02.42	-	OUT6 terminal function selection	-	-	-
P02.43	-	OUT6 terminal logic selection	-	-	-
P02.52	-	IN terminal forced effective	0 ~ 65535	-	0
P02.53	-	OUT terminal forced effective	0 ~ 65535	-	0
P02.54/P02.55	-	Input function flag register	-	-	display
P02.56/P02.57	-	Input function on flag register	-	-	display

Group P03:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P03.00	-	Position command source	0 ~ 10	-	3
P03.02	-	Pulse command type	0 ~ 3	-	0
P03.03	-	Pulse input port filtering	-	-	-
P03.04	-	Pulse smoothing filter	1 ~ 2048	100us	1
P03.06/P03.07	-	Subdivision	0 ~ 1048576	P/r	0
P03.08/P03.09	0x6091:01	Gear ratio numerator 1	1 ~ 1072741824	-	1
P03.10/P03.11	0x6091:02	Gear ratio denominator 1	1 ~ 1072741824	-	1
P03.12/P03.13	-	Gear ratio numerator 2	-	-	-
P03.14/P03.15	-	Gear ratio denominator 2	-	-	-
P03.20	0x6068	Arriving signal establishment time	0 ~ 65535	ms	10
P03.21	0x2006:07	Arriving deviation threshold unit	0 ~ 1	-	0
P03.22	0x6067	Positioning completion threshold	1 ~ 65535	P	92
P03.23	0x2006:01	Offline position deviation processing mode	0 ~ 1	-	0
P03.25/P03.26	0x6065	Alarm threshold for excessive position deviation	0 ~ 1073741824	P	393216
P03.28/P03.29	-	Stepping operation command pulse number	-1073741824 ~ 1073741824	P	10000
P03.30	-	Maximum speed of stepping	0 ~ 6000	RPM	1000
P03.31	-	Stepping operation acceleration time constant	1 ~ 65535	ms	200
P03.32	-	Stepping operation deceleration time constant	1 ~ 65535	ms	200
P03.40	-	Home position return enable control	-	-	0
P03.41	0x2006:02	Homing Mode	0 ~ 6	-	0
P03.42	-	High-speed search for the speed of the origin switch signal	-	RPM	-
P03.43	-	Low-speed search for the speed of the origin switch signal	-	RPM	-
P03.44	-	Search for the acceleration/deceleration time constant of the origin switch signal	-	ms	-
P03.45	0x2006:03	Limit the time to find the origin	0 ~ 65535	ms	0
P03.46/P03.47	-	Machine origin offset	-	P	-
P03.49	-	Mechanical origin offset and limit processing method	-	-	-
P03.50	-	Touch stop and return to zero detection time	-	ms	-

P03.51	-	Touch stop and return to zero detection speed	-	RPM	-
P03.52	-	Touch stop and return to zero torque limit	-	%	-

Group P04:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P04.00	-	Speed command source	0 ~ 10	-	2
P04.01	-	Speed command digital given value	-	RPM	-
P04.02	-	Speed command analog input channel selection	-	-	-
P04.04	0x2007:01	Jog speed	0 ~ 6000	RPM	100
P04.05	-	Acceleration time constant of digital given command source	1 ~ 65535	ms	100
P04.06	-	Deceleration time constant of digital given command source	1 ~ 65535	ms	100
P04.12	-	Speed reaching window	0 ~ 65535	p/s	10
P04.13	-	Speed arrival time window	0 ~ 65535	ms	10
P04.16	-	Speed mode jog forward speed	-	RPM	-
P04.17	-	Speed mode jog reversal speed	-	RPM	-
P04.18	-	Speed mode jog acceleration time constant	-	ms	-
P04.19	-	Speed mode jog deceleration time constant	-	ms	-
P04.20	-	Position mode jog forward speed	-	RPM	-
P04.21	-	Position mode jog reversal speed	-	RPM	-
P04.22	-	Position mode acceleration time constant	-	ms	-
P04.23	-	Position mode deceleration time constant	-	ms	-
P04.24/P04.25	-	Fixed-length stroke in position mode	-	p	-
P04.55	-	QHJX customization-synchronization speed	-	-	-
P04.56	-	QHJX customization-synchronous mode	-	-	-
P04.57	-	QHJX customization-running status	-	-	-
P04.58	-	QHJX customization-delayed start time	-	-	-
P04.59	-	QHJX customization-actual speed	-	-	-
P04.60/P04.61	-	Debugging operation pulse number	0 ~ 1073741824	P	50000

P04.62	-	Debugging running speed	0 ~ 6000	RPM	1000
P04.63	-	Debugging running acceleration time constant	1 ~ 65535	ms	100
P04.64	-	Debugging running deceleration time constant	1 ~ 65535	ms	100
P04.65	-	Movement demo mode setting	0 ~ 1	-	0
P04.66	-	Movement demo starting direction	0 ~ 1	-	0
P04.67	-	Movement demo running times	0 ~ 65535	-	0
P04.68	-	Open loop running speed	0 ~ 3000	RPM	100
P04.69	-	Open loop running acceleration	1 ~ 100	r/s^2	10
P04.70	-	Open loop running deceleration	1 ~ 100	r/s^2	10
P04.71	-	Open loop operating torque	0 ~ 100	%	50
P04.72	-	Open loop operation start command	0 ~ 6	-	0
P04.73	-	Lock shaft operating angle	0 ~ 65535	P	0
P04.74	-	Lock shaft operating torque	0 ~ 100	%	50
P04.75	-	Lock shaft operation start command	0 ~ 2	-	0
P04.76	-	Encoder calibration speed	1 ~ 100	RPM	10
P04.77	-	Encoder calibration acceleration	1 ~ 10	r/s^2	1
P04.78	-	Encoder calibration deceleration	1 ~ 10	r/s^2	1
P04.79	-	Encoder calibration torque	0 ~ 100	%	85
P04.80	-	Encoder calibration start command	0 ~ 3	-	0
P04.81	-	Encoder fault counter: receive insufficient data	-	-	display
P04.82	-	Encoder fault counter: receive empty data	-	-	display
P04.83	-	Encoder fault counter: receive CRC	-	-	display
P04.84	-	Encoder fault counter: receive serial port	-	-	display
P04.85	-	Encoder fault counter: continuous error	-	-	display

Group P05:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P05.00	-	Torque command source A	0 ~ 2	-	0
P05.01	-	Torque command source B	0 ~ 2	-	0
P05.02	-	Torque command source selection	0 ~ 9	-	0
P05.03	-	Torque command button setting value	-3000 ~ 3000	0.1%	500
P05.04	0x6072	Motor overload factor	500 ~ 3000	0.1%	3000
P05.05	-	Torque command ramp	1 ~ 65535	0.1%/s	0
P05.06	0x2008:03	Torque command limit source selection	0 ~ 4	-	0

P05.07	-	Analog channel torque limit source selection	-	-	-
P05.08	0x2008:04	Torque command internal positive torque limit	0 ~ 3000	0.1%	3000
P05.09	0x2008:05	Torque command internal negative torque limit	0 ~ 3000	0.1%	3000
P05.10	-	Torque command external forward torque limit	-	0.1%	-
P05.11	-	Torque command external negative torque limit	-	0.1%	-
P05.12	0x2008:07	Torque mode speed limit source	0 ~ 2	-	0
P05.13	-	Torque mode analog limit source selection	-	-	-
P05.14	0x2008:08	Torque mode speed limit 1	0 ~ 6000	RPM	3000
P05.15	0x2008:09	Torque mode speed limit 2	0 ~ 6000	RPM	3000
P05.16	0x2008:0A	Torque reaches the reference value	0 ~ 3000	0.1%	0
P05.17	0x2008:0B	Torque reaches valid value	0 ~ 3000	0.1%	0
P05.18	0x2008:0C	Torque reaches invalid value	0 ~ 3000	0.1%	0
P05.19	0x2008:0D	Torque arrival detection time	0 ~ 65535	ms	50
P05.20	-	Torque reaches the given value of communication	-3000 ~ 3000	0.1%	200
P05.21	-	Torque mode acceleration time constant	1 ~ 65535	ms	100
P05.22	-	Torque mode deceleration time constant	1 ~ 65535	ms	100
P05.23	-	Torque mode hold time	0 ~ 65535	ms	500
P05.24	-	Torque mode stop mode setting	0 ~ 3	-	0
P05.25	-	Torque mode communication start	0 ~ 2	-	0
P05.26	-	Torque working mode selection	0 ~ 65535	-	0
P05.33	-	Torque limit detection time	0 ~ 65535	ms	0

Group P06:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P06.00	0x2009:01	Speed proportional gain 1	0 ~ 50000	-	4000
P06.01	0x2009:02	Speed integral time constant 1	1 ~ 10000	-	1500
P06.02	0x2009:03	Position proportional gain 1	0 ~ 5000	-	800
P06.03	0x2009:04	Speed proportional gain 2	0 ~ 50000	-	4000
P06.04	0x2009:05	Speed integral time constant 2	1 ~ 10000	-	1500
P06.05	0x2009:06	Position proportional gain 2	0 ~ 5000	-	800

P06.06	0x2009:07	Speed Kd	0 ~ 50000	-	0
P06.07	0x2009:08	Speed Kr	0 ~ 50000	-	1000
P06.08	0x2009:09	Speed Km	0 ~ 50000	-	0
P06.09	-	Position Ki	0 ~ 50000	-	0
P06.10	-	Position kd	0 ~ 50000	-	0
P06.13	0x2009:0A	Load moment of inertia ratio	0 ~ 65535	-	100
P06.14	0x2009:0B	Speed feedforward filter time constant	1 ~ 10000	ms	2000
P06.15	0x2009:0C	Speed feedforward gain	0 ~ 1000	-	0
P06.16	0x2009:0D	Torque feedforward filter time constant	1 ~ 10000	ms	2000
P06.17	0x2009:0E	Torque feedforward gain	0 ~ 1000	-	0
P06.19	0x2009:10	Speed feedback low-pass filter cut-off frequency 1	1 ~ 10000	Hz	1000
P06.20	0x2009:11	Speed feedback low-pass filter cut-off frequency 2	1 ~ 10000	Hz	2000
P06.24	0x2009:13	Current given low-pass filter cut-off frequency 1	1 ~ 10000	Hz	3000
P06.25	-	Current given low-pass filter cut-off frequency 2	1 ~ 10000	Hz	0
P06.26	0x2009:14	Current feedback low-pass filter cut-off frequency 1	1 ~ 10000	Hz	3000
P06.27	-	Current feedback low-pass filter cut-off frequency 2	1 ~ 10000	Hz	0
P06.28	0x2009:15	Current proportional gain	0 ~ 50000	-	800
P06.29	0x2009:16	Current integration time constant	1 ~ 10000	-	500
P06.30	-	PVIA_KP	0 ~ 50000	-	1000
P06.31	-	PVIA_KI	0 ~ 50000	-	100
P06.32	-	PVIA_KV1	0 ~ 50000	-	100
P06.33	-	PVIA_KV2	0 ~ 50000	-	100
P06.34	-	PVIA_KA	0 ~ 50000	-	0
P06.35	-	PVIA_KVFF	0 ~ 50000	-	0
P06.36	-	PVIA_KAFF	0 ~ 50000	-	0
P06.37	-	PVIA given speed filter cut-off frequency	1 ~ 10000	Hz	1000
P06.38	-	Filter cut-off frequency of given acceleration	1 ~ 10000	Hz	1000
P06.39	-	Filter cut-off frequency of feedback acceleration	1 ~ 10000	Hz	1000
P06.40	-	Motion control algorithm selection	0 ~ 1	-	0

Group P08:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P08.00	-	RS485 device address	-	-	-
P08.01	-	RS485 baud rate	-	-	-
P08.02	-	RS485 data format	-	-	-
P08.05	-	CAN device address	-	-	-
P08.06	-	CAN baud rate	-	-	-
P08.07	-	CAN disconnection detection time ms	-	-	-
P08.30	-	RS232 device address	-	-	-
P08.31	-	RS232 baud rate	-	-	-
P08.32	-	RS232 data format	-	-	-

Group P12:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P12.00	0x1010:01	Save parameters	0 ~ 1	-	0
P12.01	-	Read parameters	0 ~ 1	-	0
P12.02	0x1011:01	Reset	0 ~ 1	-	0
P12.03	-	Clear alarm fault	0 ~ 1	-	0
P12.04	-	Reset the encoder single-turn value	0 ~ 1	-	0
P12.05	-	Reset the encoder multiturn value and fault	0 ~ 1	-	0
P12.06	-	Reset encoder fault	0 ~ 1	-	0
P12.07	-	Reset MCU	0 ~ 1	-	0
P12.08	-	Clear fault record	0 ~ 1	-	0
P12.09	-	Internal motion command mode	0 ~ 1	-	0
P12.10	-	Internal motion command	0 ~ 9	-	6
P12.11	-	Internal motion mode	0 ~ 1	-	0
P12.12	-	Internal demo mode delay	0 ~ 65535	ms	200
P12.13	-	Internal demo start command	0 ~ 1	-	0
P12.14	-	Clear position error	0 ~ 1	-	0
P12.15	-	Current step test	0 ~ 1	-	0
P12.16	-	Data sampling channel 1	0 ~ 30	-	0
P12.17	-	Data sampling channel 2	0 ~ 30	-	0
P12.18	-	Data sampling depth	0 ~ 65535	-	0
P12.19	-	Data sampling flag	0 ~ 1	-	0
P12.20	-	Save encoder parameters	0 ~ 1	-	0
P12.21	-	Brake test	0 ~ 1	-	0

Group P13:

LED parameters	Object dictionary	Name	Setting range	Unit	Factory setting
P13.00	-	Operating status	-	-	display
P13.01	-	Motor speed	-	rpm	display
P13.02	-	Speed command	-	rpm	display
P13.03	-	Motor torque	-	%	display
P13.04	-	Torque command	-	%	display
P13.07/P13.08	-	Position command counter	-	Command unit	display
P13.09/P13.10	-	Position command counter	-	Encoder unit	display
P13.11/P13.12	-	Position feedback counter	-	Encoder unit	display
P13.13/P13.14	-	Position deviation counter	-	Command unit	display
P13.15/P13.16	-	Position deviation counter	-	Encoder unit	display
P13.17	-	Position command speed	-	rpm	display
P13.18	-	Position command frequency	-	KHz	display
P13.19	-	Input signal monitoring	-	-	display
P13.20	-	Output signal monitoring	-	-	display
P13.21/P13.22	-	The current mechanical angle of the motor	-	Encoder unit	display
P13.23	-	The current electrical angle of the motor	-	Degree	display
P13.24	-	The current voltage value of the driver	-	V	display
P13.25/P13.26	-	Encoder status register	-	-	display
P13.27/P13.28	-	Input pulse counter	-	Command unit	display
P13.29	-	Frequency division output pulse counter	-	Command unit	display
P13.30/P13.31	-	Actual value of current position	-	Command unit	display
P13.32/P13.33	-	target position	-	Command unit	display
P13.36	-	Current fault code	-	-	display